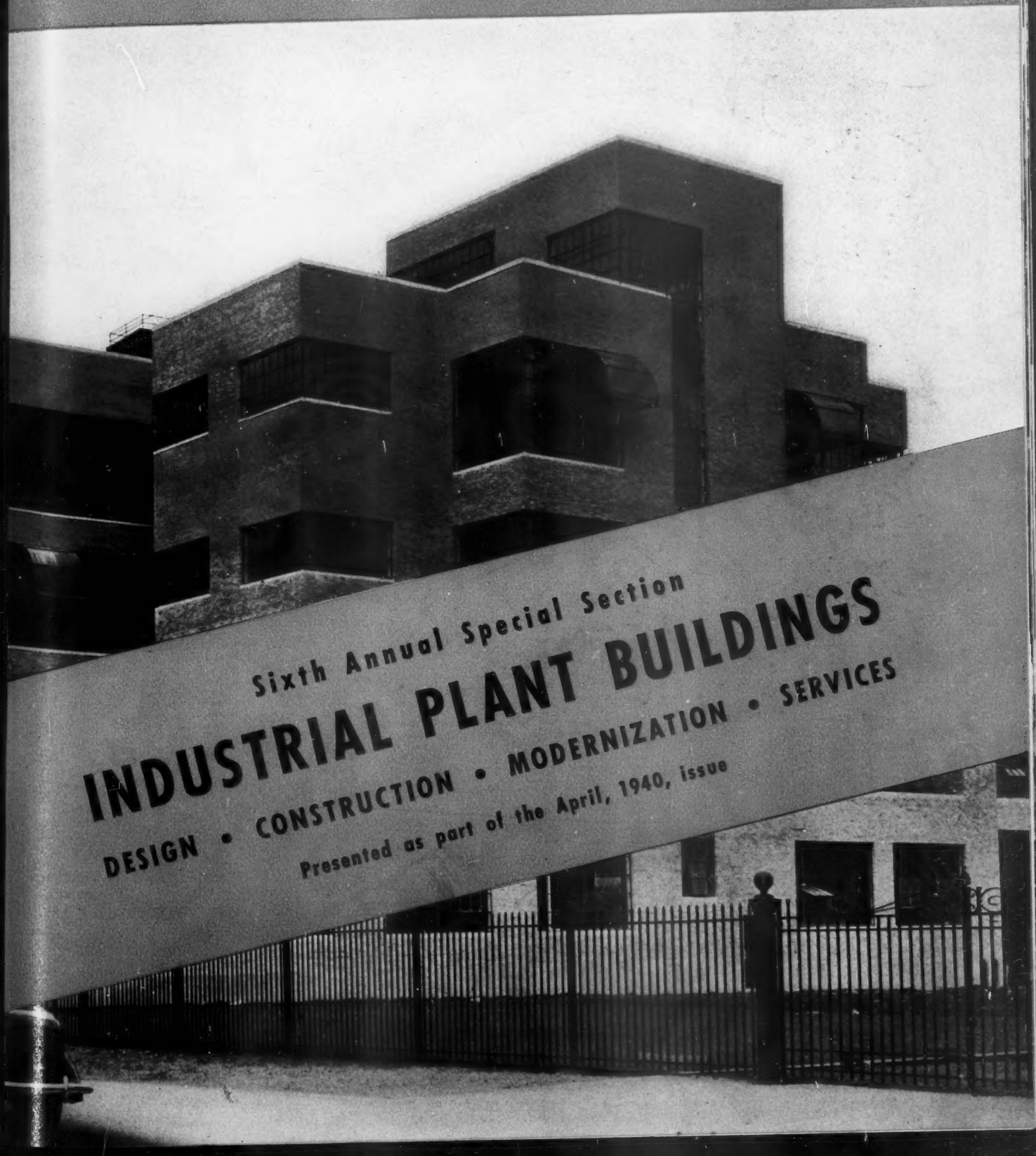
APRIL, 1940

FACTORY

MANAGEMENT and MAINTENANCE

A McGRAW-HILL PUBLICATION



Sixth Annual Special Section

INDUSTRIAL PLANT BUILDINGS

DESIGN • CONSTRUCTION • MODERNIZATION • SERVICES

Presented as part of the April, 1940, issue

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LIGHTING TO INSPECT PLATE GLASS OR SEE FFECTS IN PARTS BY SILHOUETTE
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Aluminum Industries, Inc..... B4
Alvey-Ferguson Co..... B75
American Air Filter Co. Inc..... B149
American Brass Co..... B81
American Monorail Co..... B22
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American Tel. & Tel. Co..... B79
Anaconda Wire & Cable Co..... B69
Anchor Post Fence Co..... B128
Armstrong Cork Co.....B10, 11
Arrow-Hart & Hegeman Elec. Co..... B8
Asphalt Products Co..... B132
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Babcock & Wilcox Co..... B28
Barber Asphalt Co..... B30
Barber-Colman Co..... B127
Barrett Co..... B133
Benjamin Electric Mfg. Co.....B 2nd Cover, 95
Birdseye Electric Corp..... B159
Blaw-Knox Co. B120
Blue Ridge Glass Corp..... B123
Bradley Washfountain Co..... B131
Bryant Electric Co..... B94
Buell Engrg. Co..... B108
Buffalo Forge Co..... B142
Bull Dog Electric Prod. Co..... B91
Burgess Battery Co..... B158
Burt Mfg. Co..... B158
Bussmann Mfg. Co.....B92, 93

Carey Co., Philip..... B118
Carnegie-Illinois Steel Corp..... B68
Carrier Corp. B139
Chesapeake & Ohio Lines..... B153
Clarage Fan Co..... B32
Commonwealth & Southern Corp..... B155
Consolidated Expanded Metal Cos..... B82
Continental Steel Corp..... B134
Coppus Engrg. Corp..... B17
Cornell Iron Works Co..... B159
Crane Co. B24
Cyclone Fence Co..... B104

Daybrite Lighting Inc..... B87
Dayton Safety Ladder Co..... B148
DeBothezat Ventil. Equip. Div. American Machine & Metals, Inc..... B112
Dixon Crucible Co., Jos..... B80
DuPont de Nemours & Co., E. I. insert between B18, 19
Dura-Tred Co. B136

Economy Fuse & Mfg. Co..... B98

Fedders Mfg. Co. B147
Federal Electric Co. B132
Felters Co. B121
Ferguson Co., H. K. B26
Fibre Conduit Co..... B85
Finnell System, Inc..... B15
Flexrock Co..... B160
Frigidaire Div. G.M. Corp. B125

Gardner-Denver Co. B107
G. E. Co. (Lamp Dept.)..... B18
G. E. Co. (Mdse. Div.).....B20, 21
Goodrich Electric Co. B106
Graybar Electric Co.....insert, B83, 102
Grinnell Co. B13

Harnischfeger Corp. B16
Hild Floor Machine Co..... B140
Holophane Co., Inc..... B137
Hough Shade Corp. B120
Hubbell, Inc., Harvey..... B96

Ilg Electric Ventilating Co..... B86
Independent Pneu. Tool Co..... B90
Industrial Controller Div. of Square D.. B89
Inland Steel Co.....B3rd Cover
International Engrg., Inc. B134
Invincible Vacuum Cleaner Mfg. Co..... B128

Jefferson Electric Co. B101
Johns-Manville, Inc. B19, 72, 162
Joyce-Cridland Co. B161

Kidde & Co., Walter..... B31
Kinnear Mfg. Co..... B110

Lamson Co. B29
Lehigh Portland Cement Co..... B129
Libbey-Owens-Ford Glass Co..... B123
Logan Company B78
Lumidor Mfg. Co. B122
Lux Fire Extinguishers..... B31
Lyon Metal Products, Inc..... B115

Magnus Chemical Co. B124
Mahon Co., R. C. B9
Maple Flooring Mfrs. Ass'n..... B119
Medart Mfg. Co., Fred..... B160
Medusa Portland Cement Co..... B113
Mesker Co., Geo. L..... B103
Middlesex, N. J., County of..... B152
Milcor Steel Co.....insert between B126, 127
Mills Company B124
Modine Mfg. Co.....B4th Cover
Morton Salt Co..... B126

National Carbon Co..... B88
Nitrose Co. B148
Oakite Products, Inc..... B130

Page Fence Ass'n..... B132
Pangborn Corp..... B116
Paraffine Companies, Inc..... B135
Parke, Hall & Co..... B156
Paterson Industrial Commission..... B154
Pittsburgh-Corning Corp. B23
Pittsburgh Plate Glass Co. (Brush Div.).. B130

Rau Co., Henry S..... B150
Rockbestos Products Corp..... B117
Ross Engrg. Corp., J. O..... B122
Ryerson & Son, Inc., Jos. T..... B34

Sarco Co., Inc.....insert, between B114, 115
Scott Paper Co..... B33
Sherwin-Williams Co..... B6, 7
Sly Mfg. Co., W. W..... B70
Spencer Turbine Co..... B74
Square D Co..... B89
Standard Conveyor Co..... B109
Stanley Electric Tool Div. Stanley Works. B73
Stewart Iron Works Co., Inc..... B138
Sturtevant Co., B. F..... B114
Surface Combustion Corp..... B14
Swartzbaugh Mfg. Co..... B161

Thomas & Betts Co., Inc..... B84
Torit Mfg. Co..... B136
Trumbull Electric Mfg. Co..... B100

U. S. Gutta Percha Paint Co..... B77
U. S. Steel Subsidiaries.....B68, 104

Vande Water & Co., E. T..... B157
Victoria Paper Mills Co..... B161

Webster Electric Mfg. Co..... B97
West Disinfecting Co..... B5
Westinghouse (Lighting Div.) B111
Westinghouse (Mazda Lamp Div.)..... B12
Westinghouse (Water Coolers)..... B105
Weston Electrical Instr. Corp..... B99
Wheeler Reflector Co..... B160
Wing Mfg. Co., L. J..... B27
Wiremold Co..... B141

WHERE TO LOCATE YOUR PLANT..B151

FACTORY

MANAGEMENT and MAINTENANCE

A. M. STAEHLE, *Publisher* L. C. MORROW, *Editor*

SIXTH ANNUAL SPECIAL SECTION

Industrial Plant Buildings

April, 1940

Lower Costs Through Better Buildings..... **B35**

Trends in Building Design.....*W. J. Austin* **B37**

New Plants of 1939.....

Pratt & Whitney.....*W. Hartford, Conn.* **B40**

General Foods Corporation.....*Hoboken, N. J.* **B44**

Spencer Lens Company.....*Buffalo* **B48**

General Motors Corporation.....*Indianapolis* **B52**

Globe Slicing Machine Company.....*Stamford, Conn.* **B56**

News Syndicate Company, Inc......*Brooklyn* **B59**

"Stock" Buildings and Their Uses..... **B62**

Landscaping Makes the Building Look Its Best.....*Arthur S. Berger* **B64**

Taking the Date Line Off the Old Plant.....*G. A. Van Brunt* **B66**

Catalog Service **B143**

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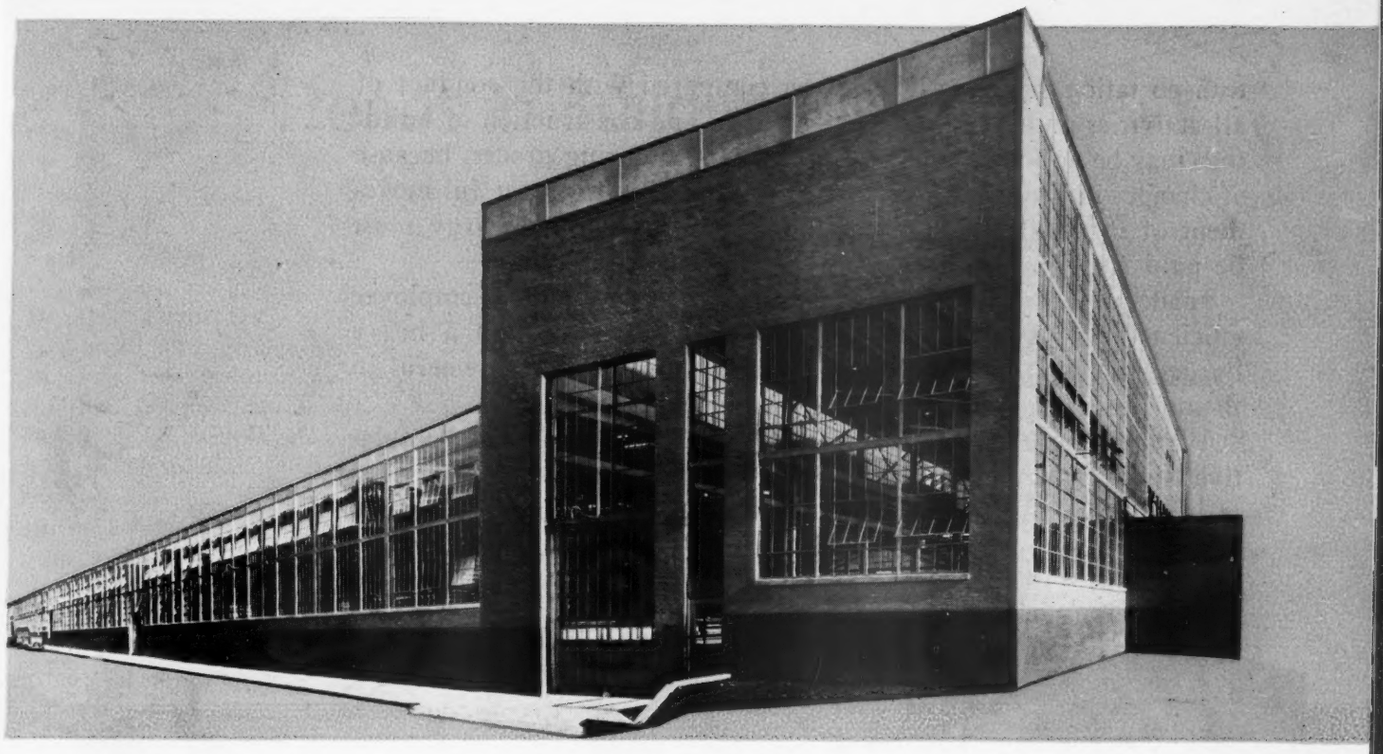


IT'S LINE PRODUCTION at the new River Plant, Pittsburgh Works of Allis-Chalmers Manufacturing Company, where raw materials enter one end and finished transformers come off the line at the other. Designed by company's own engineers

Lower Costs Through Better Buildings

INDUSTRIAL PLANT BUILDINGS are a major influence upon national prosperity. That influence is exerted through the medium of low-cost production. The effect is direct, because it is by means of progressively lower production costs that progressively lower selling prices for industry's products are established, increased sales result, more orders are placed, and more jobs are created.

More products for more people at lower prices must be industry's contribution to national prosperity, which is measured in terms of standard of living and number of jobs available.

Perhaps the influence exerted by industrial plant buildings upon production costs can be indicated most strikingly by a statement of the possible adverse effects.

Unsuitable location, geographically or as to site, can add to cost of production because of unduly high transportation or handling costs of raw materials, finished products, and fuel.

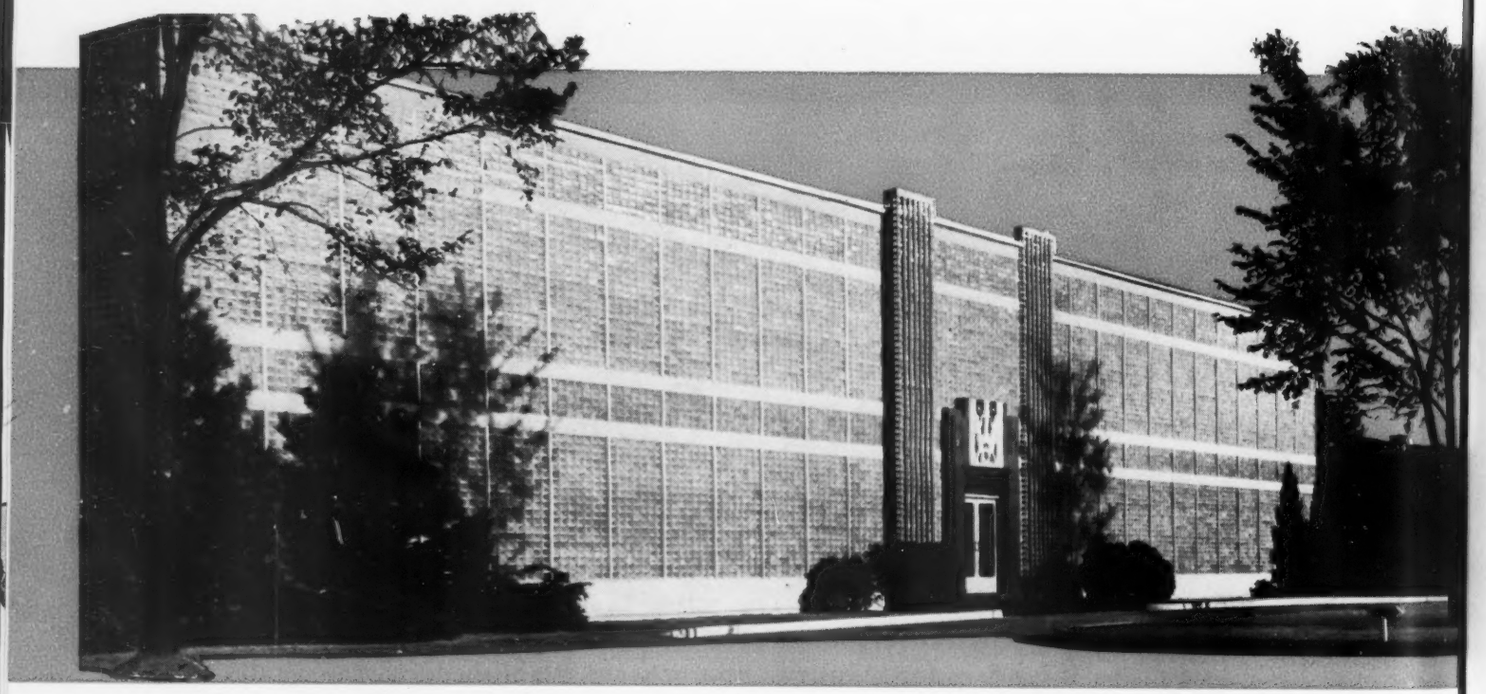
Obsolescence, or age, may cause extraordinarily high maintenance costs which, finally, must be charged against production.

Scattered building units, either on a single site or in a single industrial area, are likely to be responsible for stiff costs of inventory,

transportation, and overhead when compared with the conduct of all activities under a single roof. Design and construction of buildings may be no longer suitable to the manufacturing process because of changes in product. Costly methods of handling, wasteful movement of materials, and useless expenditure of human energy must be paid for from production.

Inadequate or antiquated plant services may affect employee efficiency or worker morale to an extent that results in a heavy burden of cost. Such services may also be exceedingly wasteful in themselves, both of power and of man-hours.

Where there are enough of these shortcomings to exert a cumulative high-cost effect in a specific industrial plant, a new building is imperative. When their number is less, modernization of the existing structure may be all that is called for.



BEAUTY TREATMENT
Good planting adds finishing touch to this handsome glass-block building, the Toledo Research Laboratory of the Owens-Illinois Glass Company

In either case the plant operating men responsible for planning and production should know what is best in industrial plant buildings. They need this information to enable them to cooperate effectively with architects, engineers, and contractors. It is only by coordination of the efforts of plant operating men and building specialists that the best end-result is achieved.

For the guidance of these plant operating men the following pages show what's what as to building equipment, materials, and services in plants recently completed; tell of trends in building design; make suggestions for bringing the old plant up to date.

This special section on Industrial Plant Buildings is a FACTORY contribution toward the accomplishment of industry's job of making more products for more people through lower production costs.

Trends in Building Design

W. J. AUSTIN, PRESIDENT, THE AUSTIN COMPANY, CLEVELAND

IN THE TREND that is driving business toward greater efficiency on every side, industry has been applying functional principles in factory design with significant results. The proportion of useful cubic content has been materially increased through modern construction, with collateral savings in overhead and maintenance expense. Fluctuating production requirements have been met by flexible layouts which lend themselves to efficient, straight-line operation, regardless of business volume.

New and unusual cross-sections, many of which have been made possible by the application of welding and the introduction of rigid-frame designs, provide broader aisles, wider bay spacing and greater clearance for carrying on any and all operations that might be required in the course of production and warehousing.

All the essential service facilities required for smooth functioning of the plant, whether it is operating at peak or a fraction of capacity, are provided either in under-floor trenches or ducts, or from outlets in strategic positions along walls and columns, or overhead above the operating level. Distribution of electric power necessary to operate hundreds of motor-driven units in a single room is accomplished without impairing basic flexibility of the entire layout, by the use of overhead bus ducts, under-floor power ducts, or similar facilities.

Problems of plant illumination are approached in a new and comprehensive fashion, with due consideration for many factors beyond the mere adequacy of light. All the aspects of controlled illumination, including quality, uniformity, direction, and cost of light, are studied scientifically, and installations are engineered to fulfill requirements as they are dictated by specific factory production problems.

In modern structures where fluorescent lighting has been installed, all glare and shadows are eliminated. Looking up toward the roofs inside such plants, they seem to be checkered with skylights, so closely does the fluorescent light reflected from aluminum or porcelain fixtures resemble true daylight. Generating little heat, the tubes which are the source of this new light simplify air-conditioning and temperature control. While the fluorescent type appears to be the best and most efficient, many establishments are finding Mazda, high-intensity mercury, and combination mercury vapor-Mazda units entirely adequate for their particular needs.

BUILDING BEGINS AT THE ENTRANCE

The factory entrance is the natural point around which to build an impression of the structure as a whole. The smaller the plant, the truer this is. Fortunately all the materials are readily available

The mastery of artificial lighting problems, dust, heat, and fume control, and other complicating factors in the operation of a many-sided industry has imparted a new meaning to the term "straight-line production." As a result, layouts are

being rearranged. Operations are falling into their natural sequence now that the obstacles to logical arrangement have been removed.

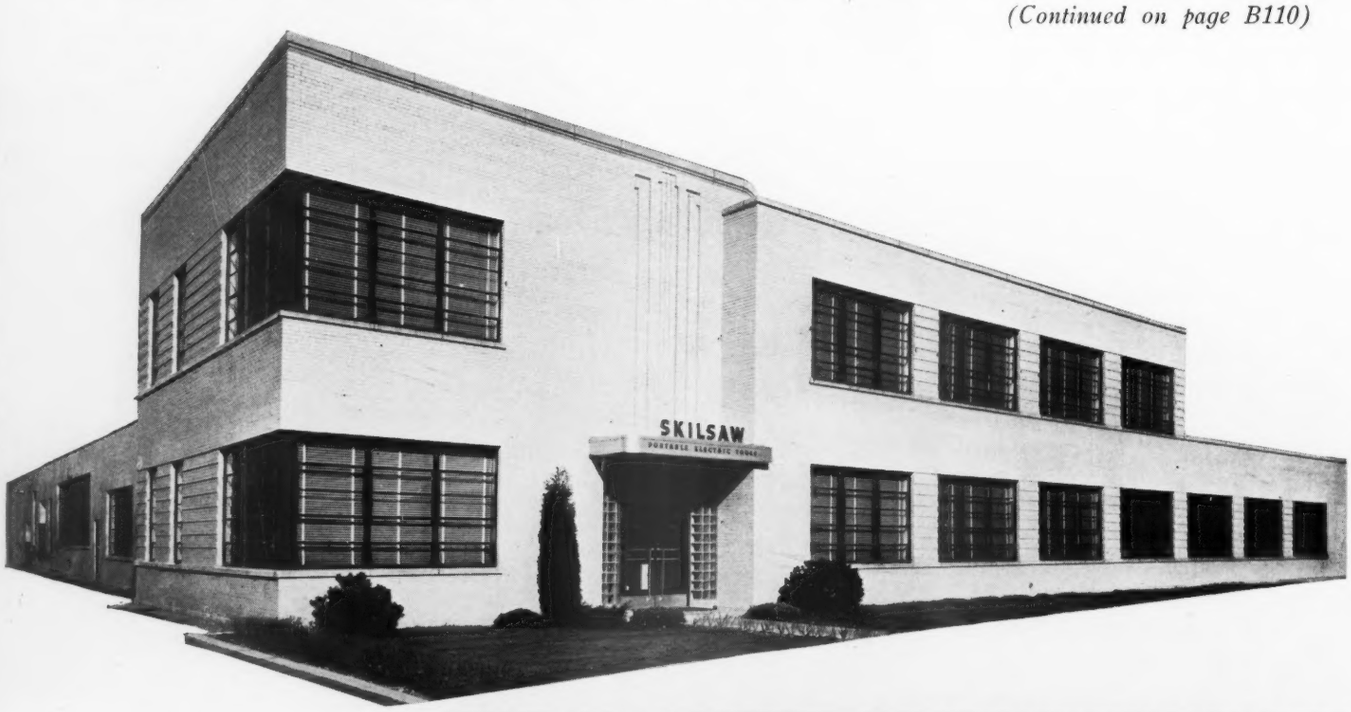
The ease of routing materials in process, plus the elimination of stairs, elevators, and many of the columns required to carry superstructures, have been important factors in influencing the trend toward single-story construction. Equally significant, however, has been the reduction of supervisory personnel gained by concerns that have transferred operations from multi-story plants. Simplified inventory and cost accounting procedures, as well as increased production efficiency, have resulted from the ease with which activities on a single level can be observed.

Partitions are at a minimum in the modern plant, where everything that complicates supervision impedes the free flow of materials in process, or limits flexibility of layout is removed. Today management recognizes that elimination of partitions saves space and money, and does away with costly diversion of materials and non-productive effort.

Thus one sometimes finds heat-treating, electro-plating, spray-painting and similar departments right out in the center of general production areas where they can be accommodated without adversely affecting conditions around them. Heat from furnaces can be removed through under-floor ducts and special exhaust facilities in the roof; hoods or ventilated glass and steel inclosures take care of vapors from plating tanks, and open spray painting is controlled in at least one instance by drawing the scattering paint from the spray out through floor grilles.

Where partitions are indispensable, they are frequently of a prefabricated type, constructed entirely of steel and glass, which can be moved if necessary. The glass has

(Continued on page B110)



SIMPLE DIGNITY

Simple and economical construction did not interfere with attainment of distinction. This plant was designed with a view to expansion. Color was introduced by painting the steel sash blue for contrast with the buff face brick of the façade. Note band effect and vertical detail at the entrance

FIRST IMPRESSION

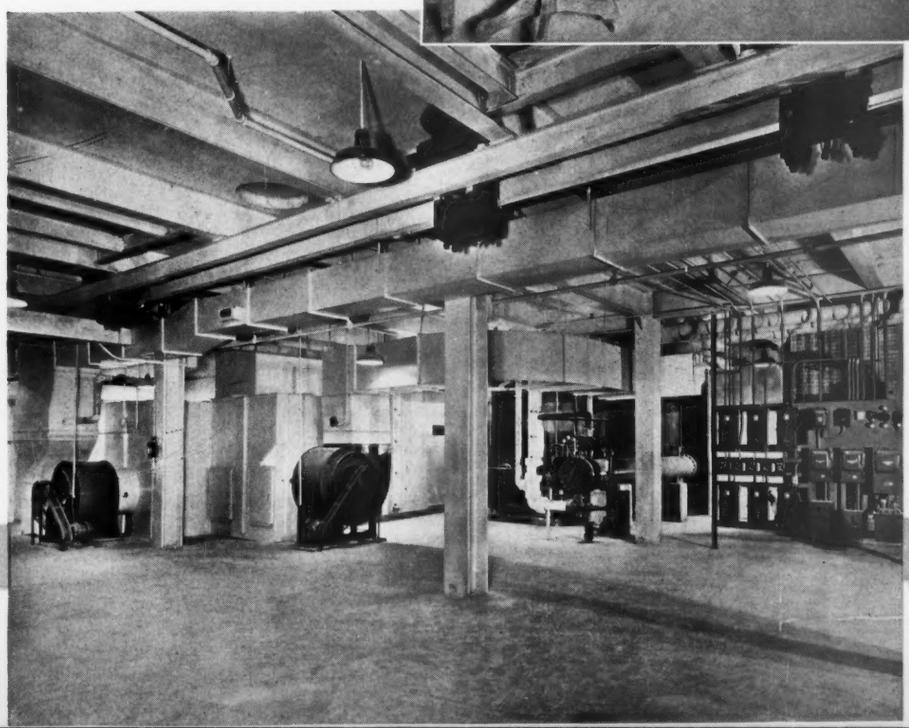
Asphalt tile for flooring, processed wood for walls, glass block for stair lighting, impress visitors favorably at the Penn Electric Switch Company

DAYLIGHT PLANT

Welded "tree-form" columns support sawtooth roof without any need for bracing, eliminate shadow-throwing cross-members at the Cummins Engine Company. Modern equipment includes unit heaters, combination mercury vapor-Mazda lighting units, overhead bus ducts to serve production machines. Hooded plating room in the center of this area is capped by a roof ventilator. Note steel sash partitions, cement-tile roof deck, floor mats on concrete floor

BUILDING GOOD WILL

A well-equipped lab with complete facilities for testing the product encourages visits by the customer, is thus a good-will builder that can scarcely be matched. Since the Penn Electric Switch Company set up a modern research department for experimental work and testing of thermostatic controls and automatic switches, the number of customer visits has jumped from about 10 a year to 160. Lighting here is exceptionally good. Combination mercury vapor-Mazda units supplement natural illumination, flood working plane with balanced light



CONTROLLED CONDITIONS

For the industry whose processes derive fundamental benefits from control of temperature and humidity, or for the windowless plant where complete control of working conditions is engineered, air conditioning is a "must." In such an industry is Church & Dwight; such a plant is the one where its two famous brands of baking soda are made. Left, fans; center, condenser and compressors; right, controls

NEW PLANTS OF 1939

Pratt & Whitney

PLANT AT WEST HARTFORD, CONN., FOR THE MANUFACTURE OF MACHINE AND SMALL TOOLS. Designer, Albert Kahn, Inc., Detroit

PRESSED FOR SPACE when 23 buildings housing its operations no longer afforded enough working area, Pratt & Whitney Division of Niles-Bement-Pond Company checked the question from all angles and came to the conclusion that lower manufacturing and maintenance costs would be best achieved through the medium of a new building which would house all operations and provide for future expansion.

Consideration was given to such important factors as flexibility of layout, minimum handling of raw and finished materials, production concentration, arrangement of departments to assure continuous flow of materials, uniform daylighting. It was found that the most suitable design for the manufacturing unit would be a one-story building with all departments under one roof.

The new plant comprises a main manufacturing building, an administration building, and a pattern and storage building with adjoining garage and boiler house.

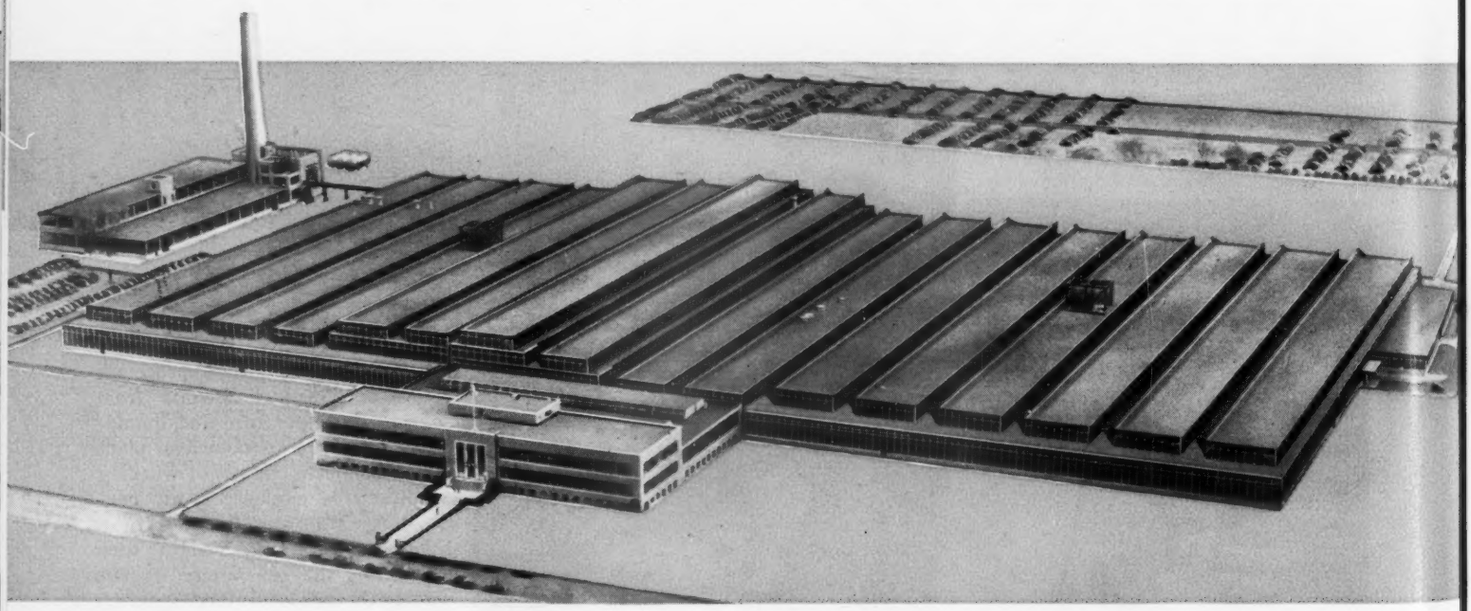
FUNCTIONAL DESIGN

Buff face brick plus wide bands of projected steel-sash windows add dignity and color to the administration building. Interior is finished with wood-veneer wall, plaster ceilings, and black-bordered terrazzo floors. Good-looking iron fence surrounds the grounds, protects company property

The manufacturing building is a one-story structure 960x520 feet with wings 182x40 feet on the east and west sides. A covered loading dock 420 feet long, with overhead trolleys, is located at the south of the building, and is served by a depressed railway siding.

Composite wood and concrete piles approximately 95 feet in length were driven in groups; they are capped with concrete foundations supporting the structural steel framework. Column spacing is 60x40 feet. Clear working space of 14 feet is provided between underside of trusses and floor level except in center crane bays which have 36 feet for 20-ton crane and 26 feet for 15-ton cranes.

Vertical monitors of the continuous-ventilator type, running north



BIRD'S-EYE VIEW shows office and main manufacturing building. Left, pattern and storage building, garage and boiler house. Behind main plant, not shown, covered dock served by depressed siding. Top, parking field. Wing at right of manufacturing building contains shower-locker accommodations; there is a similar unit at the other end

AFTER DARK

Walls of manufacturing building are virtually all-glass. Vertical monitors run north and south, provide uniform daylight lighting. For general night light, 400-watt high-intensity mercury vapor lamps are used; 100-watt fluorescent lamps in gage department. Combination Mazda and high-intensity mercury vapor lamps supply 50 foot-candles in the engineering department

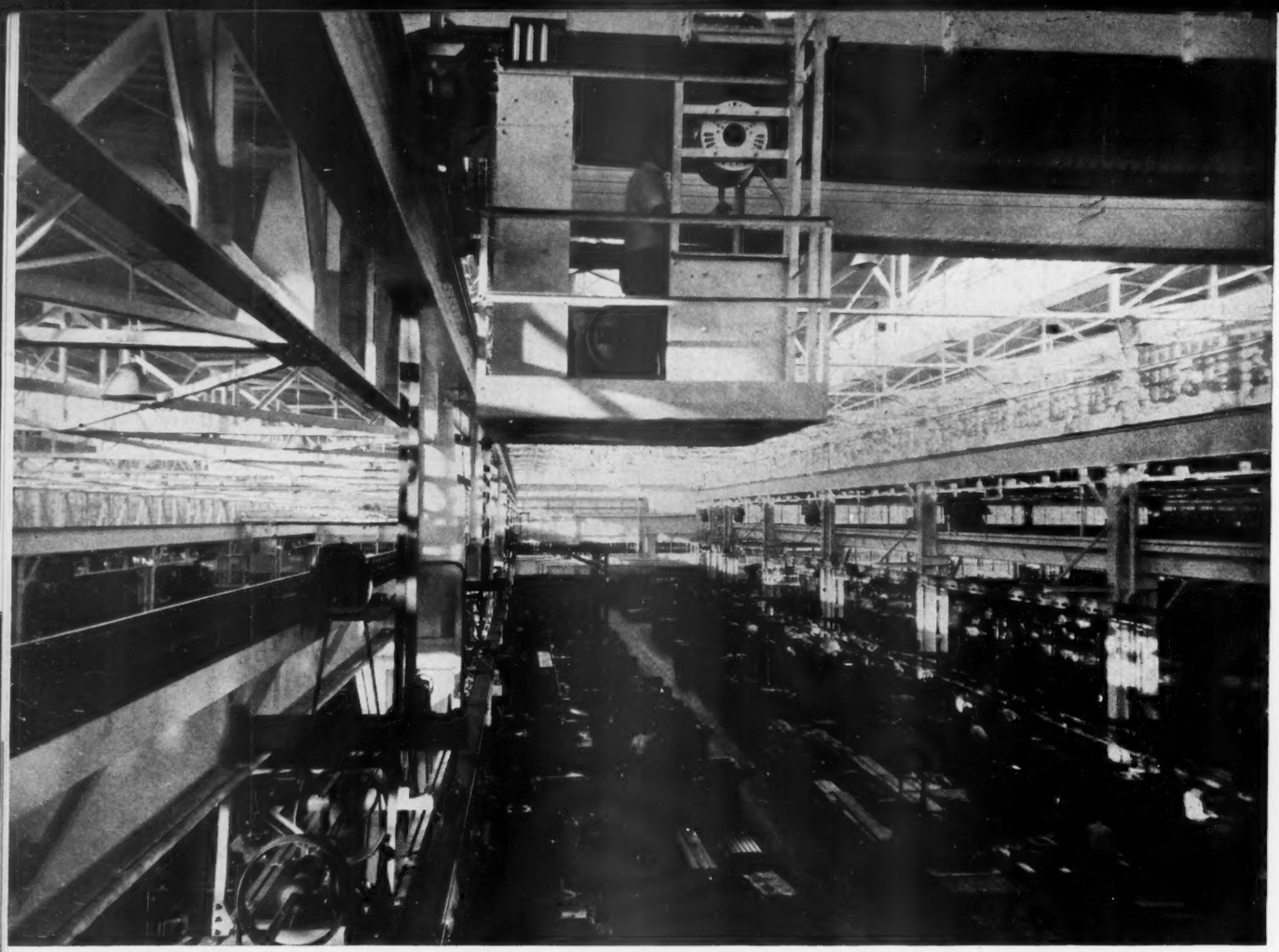
FACTORY AREA

Roof truss and monitor construction are shown in this photograph of the machine-tool assembly floor. Floors in most factory areas are creosoted

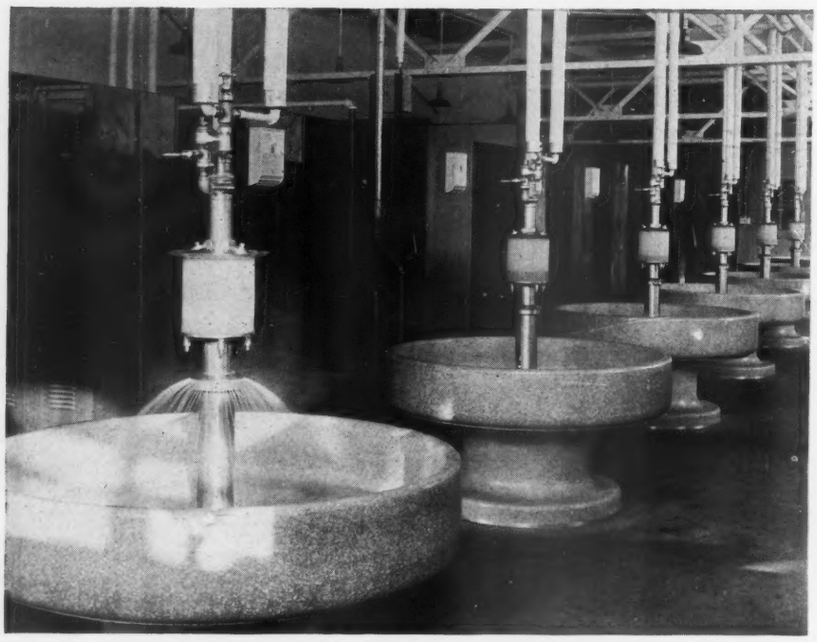
wood block, except in some sections where flexible strip wood has been substituted. But here, where heavy machinery is assembled, the floor is cement-finished reinforced concrete

GOOD FOOD

The cafeteria in the basement of the administration building can serve all of the 2,200 employees. Acoustically treated ceiling, composition tile flooring keep noise level down, make it a pleasant place to eat in. Partitions of cinder concrete and hollow tile divide employee cafeteria and a private dining room from recreation, locker, and other rooms in basement



BIG CRANE SERVES machine-tool assembly floor. Under crane runway may be seen projection-type unit heaters. They keep this big area comfortable. A hot-blast system maintains constant temperature and humidity in the gage department. The office building is heated by a two-pipe, forced-hot-water system which employs copper radiators



NO EXCUSE FOR NOT GOING HOME CLEAN

Locker rooms like this one fill two small wings located at either end of the main manufacturing building. In addition to long row of wash fountains, the rooms are equipped with shower baths and toilets. Other toilets are located overhead in manufacturing areas, so leave unobstructed working space below

and south, provide uniform daylighting which is emphasized by a new design development eliminating all blind spots through special arrangement of sash in sidewalls and monitors in continuous bands around the entire building.

All exterior walls have glazed steel sash, brick curtain walls with Gunite spandrels and walls between sash and copper roof cornice. Roof construction is steel deck tack-welded to steel purlins, insulated with 1-in. cork, and waterproofed with tar and gravel roofing. Creosoted wood-block floors have been installed generally throughout the building, except in certain sections where flexible strip wood has been substituted.

Lockers, circular wash basins, toilets, and showers have been placed in the two wings abutting on east and west ends of plant. These projections also act as entrances and locations for time-card control.

Situated conveniently throughout the manufacturing area are overhead toilets and locker rooms, inclosed by metal partitions, and with concrete floors. These rooms are placed on bottom chord of the roof trusses, leaving unobstructed space below.

Drinking fountains have been placed throughout all departments.

Projection-type unit heaters are centrally located in roof trusses, and are furnished with 30-lb. steam through mains erected on lower chords of roof trusses.

In the gage department constant temperature and humidity are maintained by and controlled through a hot blast system. This system operates in a specially constructed unit completely inclosed by glass partitions on interior walls and double-glazed windows on exterior walls. Individual exhaust systems have been developed for paint and grinding departments.

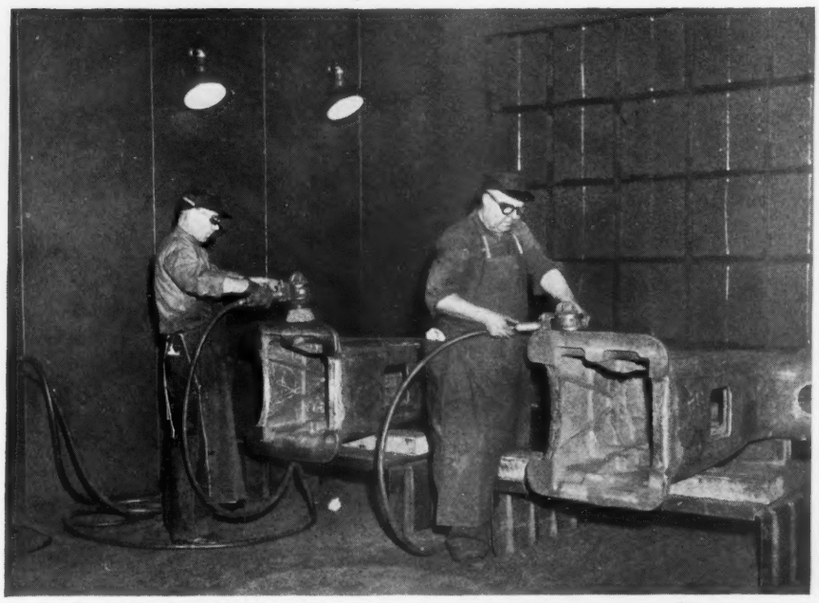
All electric current is distributed from a transformer and switchboard room centrally located in an inclosure built on bottom chords of roof trusses. Feeders lead to central distribution points, through concrete underground trenches, from which the sub-feeders serve panels with convertible-type branches. These may be disconnected and re-located at nominal cost. High-intensity mercury lighting of 25 to 30 foot-candles is used throughout, lamps being located high in trusses to give even distribution. Fluorescent lighting of 65 foot-candle power is installed in the gage department.

A sprinkler system is installed only in the paint shop and the shipping department in the manufacturing building. Water supply is obtained from mains connected to outside hydrant system, tied in with the city water service.

Services such as hot and cold water, compressed air, gas, telephones, and paging systems may be quickly re-located or extended.

Separated a short distance from the manufacturing building, yet centrally located, is a fireproof steel and brick unit comprising a one-story garage 220 x 60 feet and a two-story pattern and storage building 122 x 242 feet.

The garage section is spanned with a 60-ft. steel roof truss, giving a clear working space of 10 feet from floor level to underside of truss. A wash rack is located in the northeast corner, and drainage sumps are located throughout the floor area. Ten-foot-wide overhead doors are placed at either end of the garage. (*Continued on page B120*)



NOT SO DUSTY

Here castings are cleaned under safe auspices. Individual exhaust systems with suction fans collect chips, keep the air clear of dust and particles. Angle reflectors project light directly on the work. Other exhaust systems serve spray booths, and still another in the administration building exhausts air from kitchen and rest room

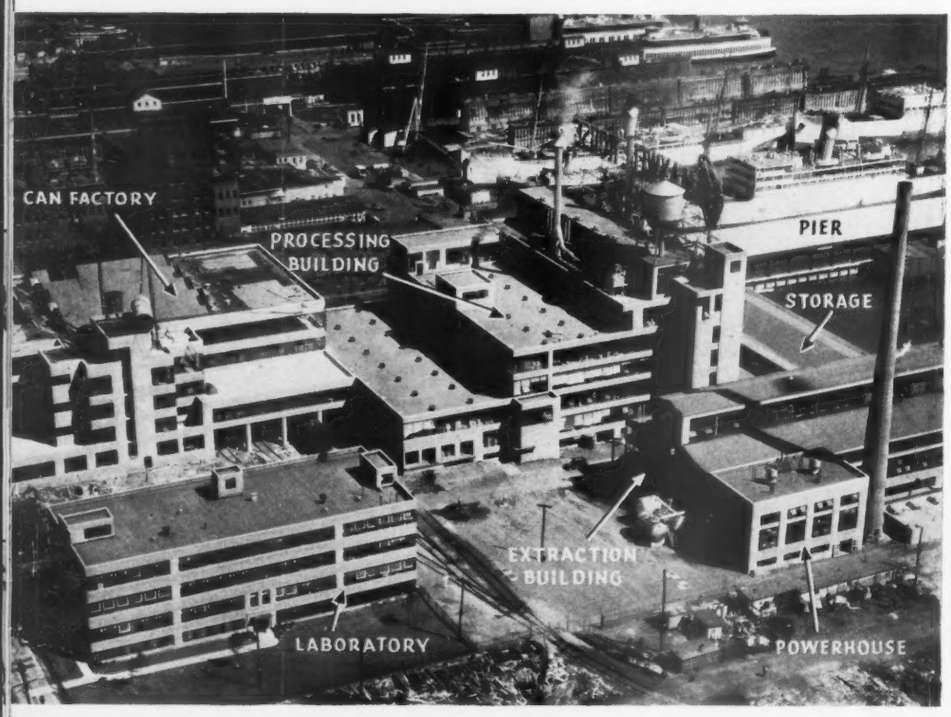
SPACE SAVERS

Conveniently located throughout the production areas, mezzanine toilets are placed on bottom chords of roof trusses, leave unobstructed space beneath for aisleways or working areas. Upstairs toilet rooms have concrete floors, metal partitions. Checkered treads make steel stairs safe. Hoist in left foreground serves steel-stock racks, carries stock to the cut-off machines in the adjoining department

NEW PLANTS OF 1939

General Foods Corporation

PLANT AT HOBOKEN, N. J., FOR MAXWELL HOUSE COFFEE, SANKA, AND KAFFEE HAG



BUILT AROUND THE PROCESS

Walls of can building (at top of page) are faced with buff iron-spot brick in bands alternating with bands of steel sash. Iron picket fence marks confines of company property. Lower photograph shows entire plant from the air, with its seven buildings identified. All told, they supply over 500,000 square feet of floor area. Plant is erected on a 9-acre tract of made land on waterfront

IF THE WORLD'S LARGEST and most modern coffee plant were not a monument to the principle that better buildings make for lower production costs, it could not long remain an example of achievement in industrial building. But we find no such economic waste in the new General Foods coffee roasting plant. That high quality standards might be maintained and bettered while keeping the cost to the consumer down to the lowest practical level, was the motivating thought behind this new plant. And it was built around the process.

Seven buildings with over 500,000 square feet of floor area were erected on a 9-acre tract of made land on this New Jersey waterfront site. All buildings had to be supported on concrete piles. An old pier was rebuilt in a most interesting construction job, so that on it might be erected a 60x513-ft. pier shed into which ships coming from coffee-growing parts of the world could discharge their cargoes.

Along a bulkhead at right angles

READY FOR BUSINESS

Pier shed, where coffee is unloaded from boats, is steel frame with steel truss roof. Walls and roof surfaces are corrugated asbestos. The concrete floor has been treated with a liquid hardener. Overhead doors, counterbalanced and fire-resistant, inclose one side of shed. Standard-head sprinklers and non-coded fire alarm system which records on annunciator in the boiler house, supply protection for the plant

Engineers and Builders, The H. K. Ferguson Company, Cleveland

to pier is the 120x330-ft. storage warehouse. At the other end of this building are the caffein extraction building and boiler house, adjoining each other. Alongside the storage building is the processing building where the coffee is roasted and packed in cans made in the can factory, also on the site and adjoining the processing building. The office and laboratory make up the seventh and last building of the plant.

In the seven buildings a variety of types are represented. Five have steel frames, two are of reinforced-concrete, flat-slab design. Of the former, two are mill type—pier shed and warehouse. And the other three —laboratory, extraction building, and power house—have special functional frames. Can factory and processing building are the concrete structures, the one of four stories, the other of six.

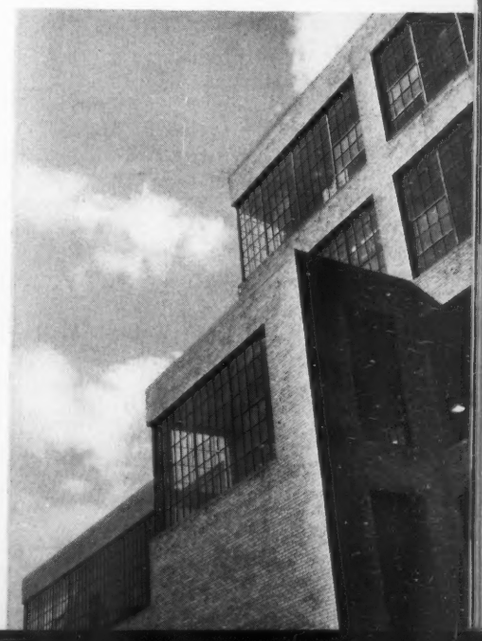
Except the pier shed and the storage building, whose walls are of corrugated asbestos sheets, all buildings are faced with buff iron-spot face brick in bands alternating with bands of steel sash which are continuous around corners to give maximum light and accent the horizontal line. Sills and copings are precast concrete.

Heavy manufacturing operations are carried out in the processing building and the can factory, and straight-line, gravity-flow routing and handling is the rule in both. In the processing building, for example, elevators raise the coffee to the top floor as it comes from the pier shed or storage building, and from there it starts its flow down through the various processing operations to shipping on the first floor. Concrete floor slabs in the two buildings are in panels 20 feet square supported by circular columns. Floor slabs in the manufacturing building are cantilevered 8 feet beyond the columns on the north and south walls. In both buildings, the manufacturing floor is kept clear by confining elevators, stairs, and fire towers in outside inclosed shafts. Both buildings have 12-in. brick walls.

All the two-course concrete floors

FROM THE GROUND UP

Daylight streams through the windows of the processing building, seen here from an angle that emphasizes the rich texture of walls faced with buff iron-spot brick. Backing up this handsome exterior is a solid wall of common red brick 12 inches thick. Bands of steel sash are continuous around the corners to give maximum amount of light and to accentuate building's horizontal lines



STORED ON PALLETS
Single-story warehouse runs at right angles to pier shed. The bags of coffee are stored here on wooden pallets, ready to be moved by electric truck to processing building which stands alongside. The warehouse is of steel-frame construction, has monitor roof. Walls are brick up to steel-sash windows, corrugated asbestos above. Steelwork has been covered with a metal-protective type of paint

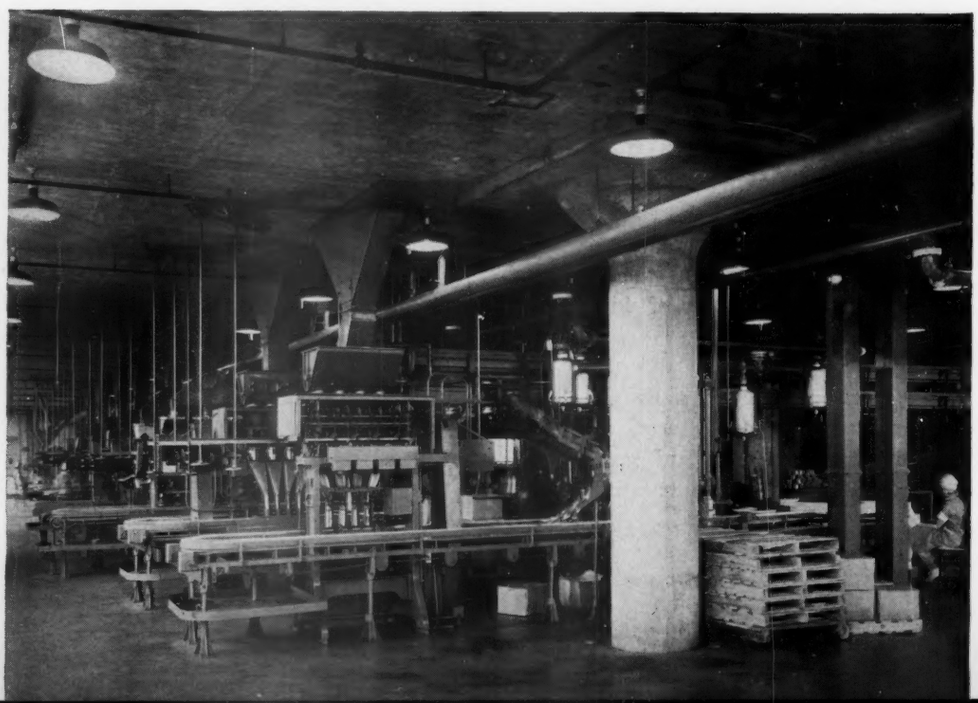
in the processing building are designed for 250-lb.-per-sq.-ft. loading. Setback roofs on this building have been designed as future floors for live loads, and the building columns have been extended through the present roof slabs and temporarily capped. Tar mastic surfaced with sprinkled slag covers the roof slabs.

Adjoining the processing building, the four-story can factory is distinguished by two unusual construction features. Above the fourth floor its reinforced concrete construction is supplemented by a steel-frame, sawtooth monitor roof for approximately half of the roof area. Gypsum planks cover this monitor roof, and they and the regular concrete roof are waterproofed with slag-surfaced built-up roofing. The other feature of this building is the first floor slab which is designed for a live load of 2,000 pounds per square foot. Its expansion joints are doweled and filled with $\frac{1}{2}$-in. premolded mastic. Second and third floors have load ratings of 300 pounds, the fourth floor of 500.

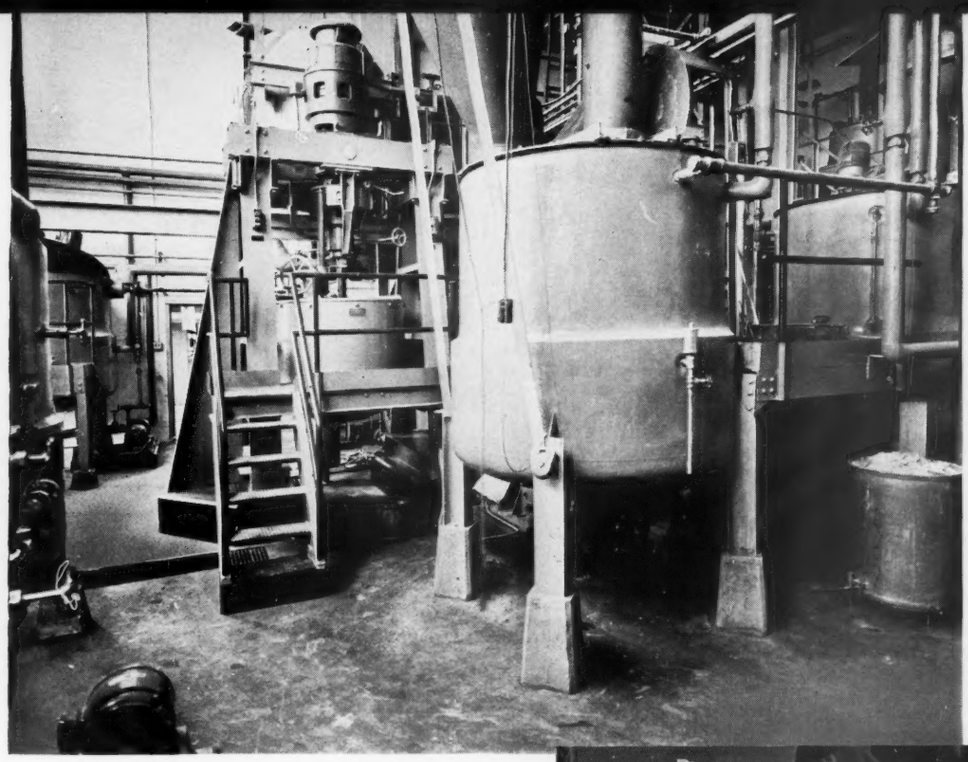
The first and second floors have a $\frac{3}{4}$-in. cement finish, while wood blocks are the wearing surface on third and fourth floors.

Another unusual feature of both buildings is the provision of inserts and holes in ceilings and floors for anchoring equipment. The can building's third-floor ceiling alone has 2,560 of these inserts.

Partitions are clay tile and steel sash. Lighting is by RLM dome fixtures except at the coffee roasters where special color-correcting fixtures were needed. Thermostatically controlled unit heaters and unit



TOP TO BOTTOM
Gravity-flow operation in the processing building moves the coffee by elevator to the top floor, whence it descends via the various process stages to the railroad and truck loading docks on the first floor. Note ceiling inserts for anchoring pipes, chutes, and equipment. Thousands have been provided here and in the can building. Two kinds of floors are used—two-course concrete and mastic



CAFFEIN OUT

Extraction building, where caffein is removed from the green coffee beans, is functional in design and construction, being intended merely as a housing for extraction equipment, some of which is shown here. Four checkered-plate floors at the various levels in this building provide sure footing. Steel gratings cover floor drains. At rear, partition of clay tile and steel plate construction

AIR CONDITIONED

Laboratory and office building has a number of features that are not found in other buildings at the new General Foods plant. Acoustic ceilings, for instance. Also asphalt tile,

radiators, supplied with steam heat, keep the buildings at comfortable working temperatures.

Safety treads have been installed on the concrete stairs. Structural steel, steel sash, and steel doors have been covered with metal-protective paint. Incidentally, the steel-sash windows of these buildings are of the sidewall-pivoted type.

Fire protection is provided through standard-head automatic sprinklers and a general alarm system which is non-coded for each

(*Continued on page B126*)

used here on the floor of this small lab. Cork insulates roof and cold-storage room. Laboratory is air conditioned. Both direct and indirect lighting

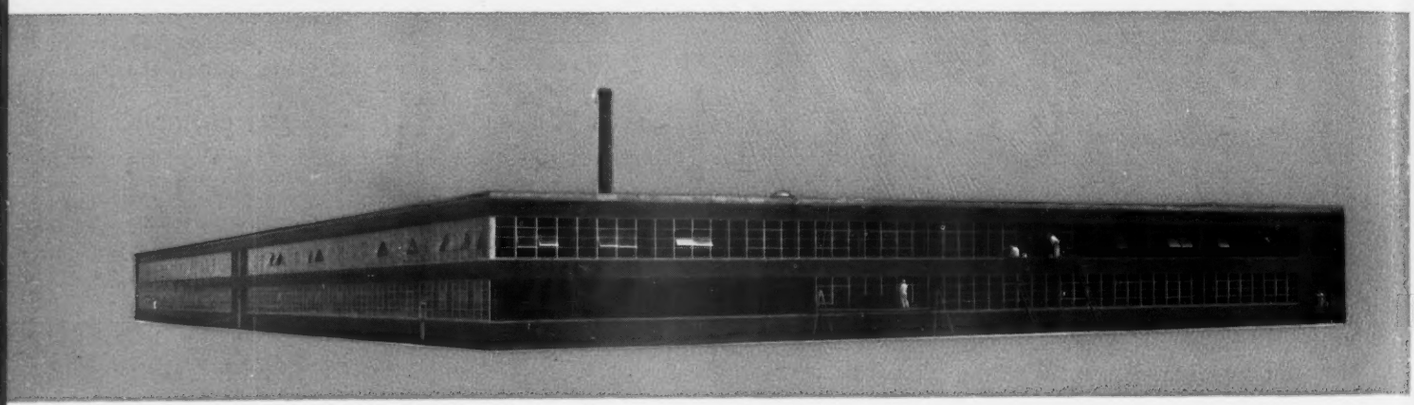
NEXT TO GODLINESS

Important in any plant, cleanliness is doubly important in one that processes food. Here one finds foot-rail-operated wash fountains. Lockers have gable tops for easy cleaning and to discourage employees from tossing odds and ends on top of them. Water coolers in all buildings supply plenty of cool, palatable, drinking water

NEW PLANTS OF 1939

Spencer Lens Company

PLANT AT BUFFALO FOR MANUFACTURE OF PRECISION PARTS FOR OPTICAL INSTRUMENTS. Builder: The Gillmore-Carmichael-Olson Company, Cleveland



TWO-STORY PORTION of plant houses offices, engineering department, cafeteria, locker rooms. Single-story manufacturing section lies behind. Walls of red-shale face brick cover structural steel and concrete construction

LIGHT MECHANICAL PARTS that demand extreme accuracy cannot be processed under just any old plant conditions. Spencer Lens Company, aware of the need for a plant technically and economically adapted to its product and processes, subscribes therefore to the lower-costs-through-better-buildings idea, saying it with a new manufacturing building containing 101,900 square feet of floor space.

The building is 210 x 410 feet over-all, of steel, red shale face brick, and concrete construction. The factory part of the structure is single story, with column spacing 30 x 40 feet. A two-story section on two sides contains offices, engineering department, locker rooms, cafeteria, and completely equipped kitchen.

Roof is semi-rigid frame. Deck is poured gypsum with 4-ply asphalt

FIRST-RATE SEEING

Top, more than 600 power, water, and air outlets sprout from wood block floor of manufacturing department. Dust collector in center of floor is part of a central exhaust system, serves several grinders. Wire partitions separate tool cribs from main section. Sawtooth monitor roof guarantees first-rate seeing conditions

PALATABLE WATER

Right, partitions of light buff tile with steel-sash windows separate heat-treating, polishing, and plating operations from main manufacturing area. Drinking fountains — there is one under the clock — supply plenty of good water at safe temperatures

CENTRAL EXHAUST

Left, enameling section gets daylight through corrugated wire-glass windows in 8-ft. monitors, artificial illumination from mercury-Mazda units. A light gray paint on roof beams and ceiling gives high light reflection. Water-wash spray booths are served by an exhaust system which extends through plant. Unit heaters supply heat from low-pressure steam system

and gravel covering on flat sections, and steep asphalt on slopes. Eight-foot fixed windows of corrugated wire glass in the sawtooth monitors run the entire length of the building; clear and wire glass in sidewalls. More than an acre of window glass is built in. Steel-sash windows are hand operated, commercial projected and pivoted types. As additional aid to lighting, inside walls are of light tan tile, and steel, rough masonry, and factory ceilings are painted with light gray inside paint.

Mercury vapor and Mazda combination units, 400 and 450 watts respectively, give an average 45 foot-candles of light at working plane height. Auxiliary lights are mounted on machines where needed.

Office floors are concrete. Terrazzo was used in toilets. Acid-resisting asphalt is used on floors and drain trenches of the plating room, with duck boards in aisles. Floors in main plant, 120 x 380 feet, are of wood block for comfort and noise reduction. Power, water, and air lines are buried in the floor's concrete base.

Advance layouts located more than 600 outlets in the floor where needed for machines.

Photocell Control

A separate power and heating plant with 126-ft. radial brick stack burns heavy fuel oil in fire-tube boilers, controlled by photoelectric cells and thermostats. Heat in the plant is furnished by filtered air from a central fan system. Offices and several rooms are furnished with direct radiation and unit heaters. There is a two-pipe, low-pressure steam system.

Solid partitions are both glazed and light buff facing tile. Partitions separating plating, polishing, and heat-treating departments are tile and steel sash. On opposite side of plant, tool cribs are separated from the main manufacturing department by wire partitions.

Stair wells are closed off by fire doors. In the shipping department, overhead rolling steel curtain doors inclose the platform.

In the locker rooms showers and foot-controlled group washfountains are provided. Gable-top lockers prevent dirt and refuse accumulations on locker tops.

A central ventilating system includes dust collectors on grinding equipment of all kinds, and exhaust ducts from water-wash spray booths and drying ovens.

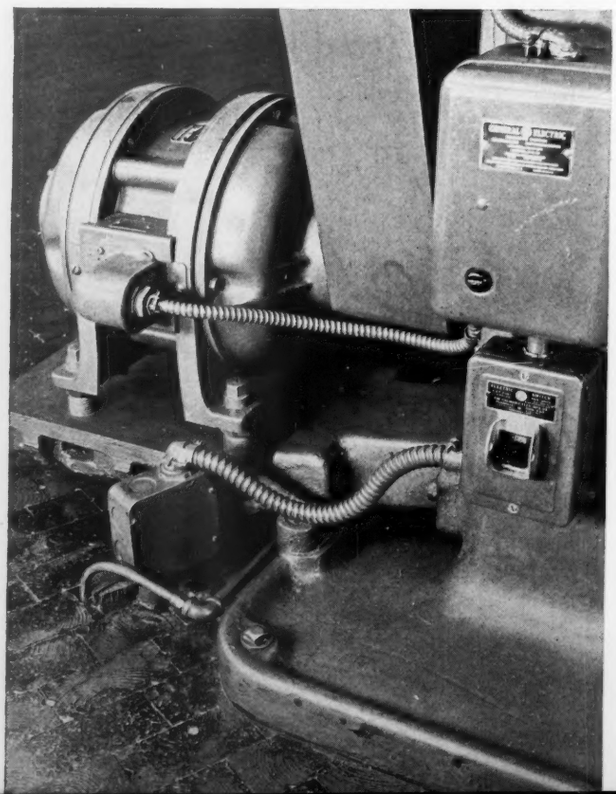
For fire protection there is an automatic wet sprinkler system. For general plant protection, a galvanized chain link fence.

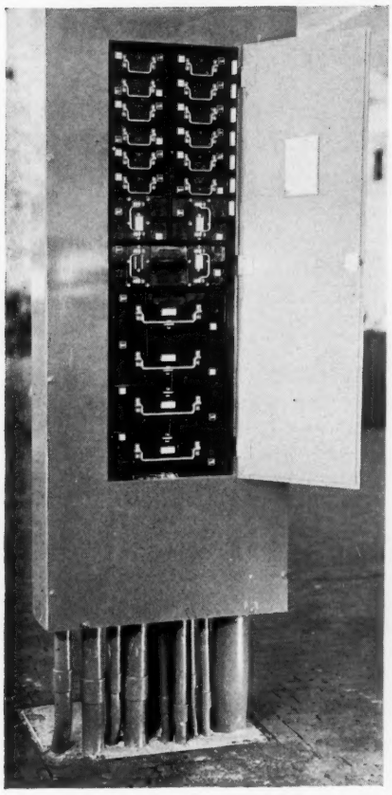
CUTTING DOWN THE NOISE

Grooved and creosoted wood blocks, laid on concrete, are used for floors in the main manufacturing area of this plant. Plating room has drainage trenches and floor covered with acid-resisting asphalt mastic; creosoted duck boards are used in the aisles. Choice for office floors is concrete; for toilets, terrazzo. Concrete floors have been treated with metallic hardeners to stop dusting

SERVICES TO PRODUCTION

Power, water, and air lines are buried in the concrete base of the main manufacturing floor. But factory layouts were made while the plant structure was still in the planning stage, and more than 600 power, water, and air outlets were located where needed, thereby insuring flexible distribution of electrical energy and other services to production. Here, a typical power connection





PLANNED POWER

Above, control panel for under-floor electric power. Advance layouts of the entire plant made it possible to locate power lines out of sight and out of harm's way, with all the outlets necessary for flexible service

GOOD PLACE TO EAT

Above, right, good meals can be had at low cost in the company cafeteria located in the two-story section of the plant. The adjoining kitchen is completely equipped and a model of its kind. Here, as elsewhere in the plant, partitions are of light buff tile. Globe-like fixtures supply all the light that is required, unit heaters the heat. Roof construction is of poured gypsum on steel beams

SWEET AND CLEAN

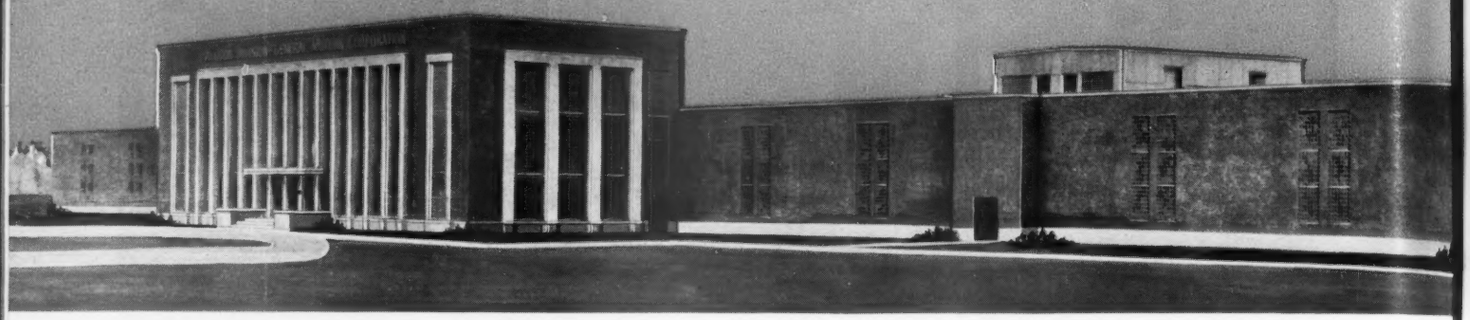
Plenty of sunlight and fresh air in the locker room. Group washfountains of enameled iron are foot-controlled. Note that the lockers have the modern gable tops that make for cleanliness. Showers? Of course. No good reason why anyone should go home dirty. At the rear, one of the many drinking fountains placed conveniently both in working and in service areas. Unit heater puts heat where it is wanted

NEW PLANTS OF 1939

General Motors Corporation

ALLISON DIVISION PLANT, INDIANAPOLIS, FOR MANUFACTURE OF AIRPLANE MOTORS

Designer: The Austin Company, Cleveland, in collaboration with General Motors and Allison engineers



IN THE SEARCH for ideal working conditions, on the acknowledged principle that they are a factor in producing better products at lower cost, Allison Division of General Motors Corporation has hit on an impressive combination of windowless plant, air conditioning, and artificial lighting in its plant at Speedway, Ind., a suburb of Indianapolis.

Four buildings and 53 acres of land comprise this new aircraft engine plant — the manufacturing building, its adjoining office building, a test building, and a gate house. The main unit, the windowless, artificially lighted, air-conditioned manufacturing building, is constructed of steel columns, welded steel trusses, and a steel-deck roof with 2 inches of insulation and a 3-ply tar and gravel surface. Clearance from floor level to underside of trusses is 15 feet.

Exterior walls are face brick with a back-up of 8-in. cement block, with Indiana limestone coping. Interior walls, roof beams, and underside of roof deck have been painted with aluminum paint. Interior partitions separating sections of the building are of cement block, except those partitions around the heat-treating department, which are of a block that has special insulating value. A 6-in. concrete floor is used throughout the entire building. For architectural effect, vertical glass-block panels have been installed on the exterior of the structure, toward the street.

Ventilating steel sash has been used in the receiving room and plant maintenance and power plant because these areas are not air conditioned. The receiving room and entrances have been arranged so that they act as air locks. In other words, when materials enter the building, they go first into a room that is not conditioned, then into the conditioned area. This prevents direct infiltration of outside air into the air-conditioned areas.

The office building adjoins and is centered on the exterior of the manufacturing building. Three stories high, it has an exterior of face brick, glass-block windows, limestone coping and trim.

This building is of fireproof construction, with structural steel frame, bar joists, concrete floors, same type roof as on manufacturing building, suspended ceilings, plastered walls, metal doors and trim. In it are a doctor's office, hospital and first-aid room, toilet facilities, and rest rooms. The entire third floor is given over to a cafeteria.

At the southwest corner of the manufacturing building, and connected with it by a corridor, is the test building. It is one-story high, with a basement, and contains engine test rooms. Air drawn by the propeller comes in through a stack at one end of a test cell, is exhausted through a similar ventilating stack at the other end.

Adjacent to this building, and also connected to the corridor leading from the manufacturing building, is a propeller-balancing building—a one-story structure, brick walls backed with cement blocks, concrete roof supported on steel beams, and concrete floor.

The gate house, at the service entrance to the property, is in keeping with the design and construction of the main buildings. Paved roads and walks lead from the street to the office building, and concrete roadways are provided from the service entrance to the receiving room and along the southerly side of the manufacturing building to the shipping room. There is a railroad siding at the easterly end of the manufacturing building.

Extreme accuracy must prevail in the operations in this plant. Poor seeing conditions increase spoilage. So the latest fluorescent luminaires,

FLUORESCENT

Five times as much light for seven-tenths as much electricity. That is Allison's experience with three-lamp, daylight, fluorescent units. Installed on 12½x13-ft. centers, 14½ feet above floor, these units supply 28 to 30 foot-candles at work levels. They are supplemented by RLM dome units for janitors' and watchmen's use. Floor here is 6-in. concrete with expansion joints, has been given hardening treatment

with daylight lamps, have been provided to give an average light intensity of 28 to 30 foot-candles, and illumination comparable to mid-day north light.

Lighting units are installed on 12½x13-ft. spacings, are mounted 14½ feet above the floor, and each unit has three 40-watt lamps. To eliminate stroboscopic effect, or cyclic flicker, each unit is supplied from a 3-phase circuit with the individual lamps connected to separate phases.

The air-conditioning facilities are so designed that much of the year it will be possible to take advantage of natural air, which remains at the required temperature and humidity in Indianapolis. When that favorable condition fails to exist, the plant's equipment will heat or cool, humidify or dehumidify the air.

Fans, coils and capillaries, mo-

KILLING THE ROAR OF THE MOTOR

Engine test cell in test building, at southwest corner of manufacturing building and connected to it by a corridor. Air drawn by the propeller comes in through a stack at one end of the cell, is exhausted through a similar stack at the other. Ceiling is of creosoted red oak. Soundproofing in stacks kills roar of motors

MOTION ECONOMY APPLIED HERE

Furnaces and cooling tanks are sunk into the concrete floor of the heat-treating department. Makes the equipment a whole lot easier to get at. Lower portions can be reached conveniently through the basement. Walls of heat-treating departments are constructed of insulating block. Mechanical handling by traveling crane and hoist

UNDER THE ROOF

Welded trusses support the roof at the new plant of the Allison Division of General Motors Corporation. Steel-deck roof is covered with 2 inches of insulation, has a 3-ply tar and gravel surface. Underside of roof deck, trusses, and interior walls are painted in aluminum paint. Note how pipes and fluorescent luminaires are hung from the ceiling. Since heat emission from fluorescent lamps is low, they fit nicely into the air conditioning scheme, and provide intensities averaging 28 to 30 foot-candles

tors and pumps are mounted on concrete and cork foundations to eliminate condensation, dripping, and vibration.

Air is cooled by interchange with coils through which cold water is circulated. In the wintertime, with oil burners to do the heating, hot water is circulated through the same coils. Two eliminators prevent entrained water from lodging on the coils during a heating period, condensate from being carried into the distribution system during cooling.

For cooling, 54-deg. well water, pumped on the property, is used much of the time. When this natural coolant is not sufficient, Freon refrigerant supplements it. Reciprocating refrigerating machines circulate the water.

The cold well water, after performing its task as water cooler, leaves the air conditioning system still sufficiently cool to serve for condensing purposes, and for jacket cooling the diesel units that provide the plant's power, and the engines under test. This cooling must be done with interchangers, however, because of carbonates in the water.

The paint shop is the only other building unit that is air conditioned.

PENTHOUSE

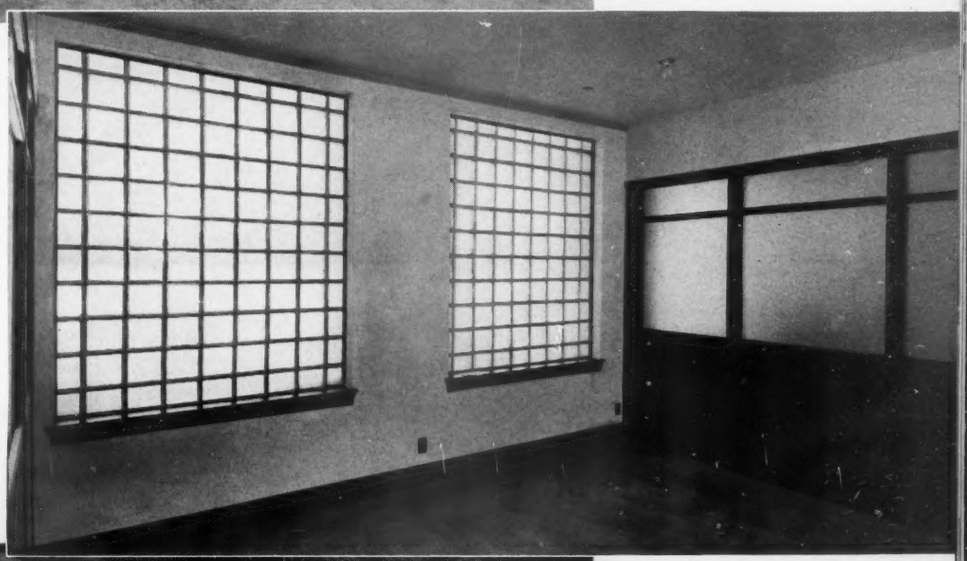
Eight separate air-conditioning units are located in four penthouses, like this one, on top of plant. Capillary conditioners wash, heat or cool, humidify or dry the air, which is either recirculated or drawn from outside, depending upon outside wet-bulb reading. Fans (foreground) drive prepared air into distributing system. Penthouse walls are of corrugated cement asbestos. Windows here and in the receiving room and power house are steel sash because these three plant areas are not air conditioned

CLEAN AIR

Good example of care taken to insure healthful working conditions is found in this department where castings are cleaned. Note the slot running along the edge of the table. Metal dust from grinding machines is sucked through it and away from the breathing area of workmen in this section. Clean air comes in from air ducts above, is drawn down past the faces of the operators

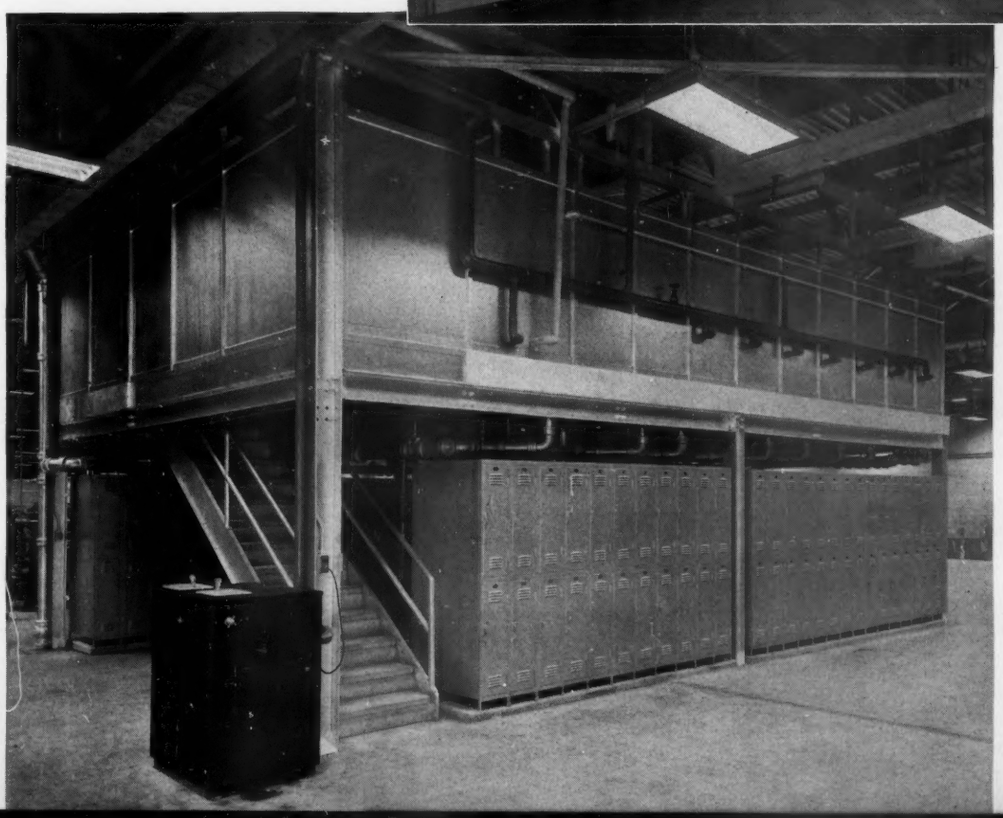
As it is isolated from the main factory, it has its own capillary unit, complete with washers, fans, pumps. Air is exhausted by separate exhaust fans; none of it is recirculated. Unit heaters and ventilators suffice to heat and cool other buildings of the plant.

Special provisions for healthful working conditions are found in the casting cleaning room.



AN OFFICE

View of typical office taken while in process of construc-



tion shows use of steel and glass partitions, also glass block windows. Office building is air conditioned. Of fireproof construction it is three stories high. Floors are concrete. There is a cafeteria on the third floor

ONE FLIGHT UP

Three mezzanine toilet and washroom units are placed in convenient locations. In center of square formed by banks of lockers is a trio of circular washfountains of group variety. Stairs of steel lead to toilets on the mezzanine. In foreground a two-faucet drinking fountain

PLANT ON A HILL in the country. Except for wooden roof deck and purlins, the entire building is of steel and masonry construction with walls of 8-in. cinder block and 4-in. brick veneer. Office is in the wing at left

NEW PLANTS OF 1939

Globe Slicing Machine

BLOWER HEATER is one of three in the shop. Plenty of light ordinarily enters through vertical monitor and skylight. Daylight is supplemented by good artificial illumination from RLM dome reflectors. Roof is 4-ply

NO DUST IN THE PLANT
Dust-collection system begins at the buffing and grinding machines, ends at these two cyclones on the roof. The ducts are placed under the wood floor of the plant where they are out of sight and out of the way. Individual blower exhausts are provided at sanding benches and for gas welding. All windows are steel sash—pivoted type in monitor, projected rack-and-pinion operated type in lower windows

Company

PLANT AT STAMFORD, CONN., FOR MANUFACTURE OF MEAT SLICERS
Architect: Leo F. Caproni, New Haven.

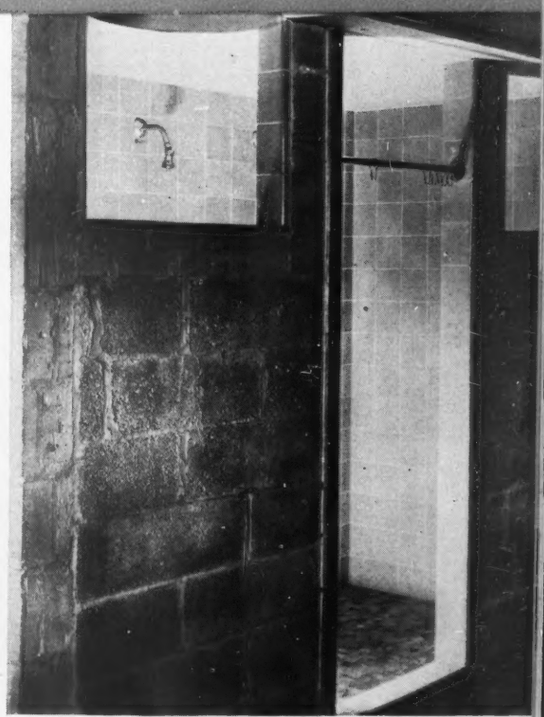
WHAT MODERN BUILDINGS promise for the smaller plant is demonstrated in Globe Slicing Machine Company's new Connecticut home. Here is a plant, employing about 100 people in its factory and office, that put up this new building expressly to gain economies inherent in a structure designed to meet its particular requirements, and to house its equipment and manufacturing routines compactly.

A single-story building, except for a mezzanine in which lockers and washroom and a storage area have been placed, the plant has about 30,000 square feet of floor area. This space is sufficient for the plant's present requirements. But this compactness is in no sense a limitation, for there is room for expansion in three directions. It is rather an application of the idea that it is wise to build a plant around the processes that are to be set up within its walls.

Masonry, steel, and timber are the structural materials principally embodied in the construction. Structural steel, including steel roof trusses that give the main manufacturing area a clear span of 80 feet, forms the frame for masonry walls and a wood roof. Beneath the trusses is a 12-ft. clearance.

Walls are 8-in. cinder blocks with a 4-in. red brick veneer, because this combination has the merit of combining economy, acoustical value, and good heat-insulating qualities. Timbers across the steel trusses and the steel frame support the roof deck which is composed of 2-in. wood planks, a 1-in. layer of cork insulation, and 4-ply built-up roofing.

Good lighting is an important feature of this plant. The manufacturing area has a vertical monitor and a skylight. On all sides of the building are high steel-sash windows with ventilators of projected and pivoted types. A cinder-block-and-glass partition put up to sepa-



READY FOR THE CLEAN-UP
This is a small plant, so the three showers in the tile-finished compartment at one end of the locker room are enough for everybody. Any worker who wants to go home clean, may do so

rate plating and shipping and receiving rooms from other operations cuts off little light, because it is more glass than cinder block. RLM dome fixtures supply artificial light when it is needed.

The wood floor is apitong, sometimes called Philippine teak. It has been treated with oil preservative. In the locker room, located on the mezzanine at front of the building, a gray linoleum floor covering has been laid over a fir base.

Ducts of the dust-collecting system have been placed under the wood floor so that they are out of sight. On the roof above the main bank of buffing and grinding machines are two collectors and exhaust vents. Individual blower exhausts are provided at the sanding bench and for acetylene welding.

Electrical conduit, on the other hand, has been placed overhead so that it is easily accessible in the event that machine locations must be changed.

Three overhead, blower-type unit heaters which can be used for summer ventilation, distribute steam heat throughout the shop in winter.

At the rear of the plant, and opening to the shipping platform from the shipping and receiving department, are wide overhead doors.

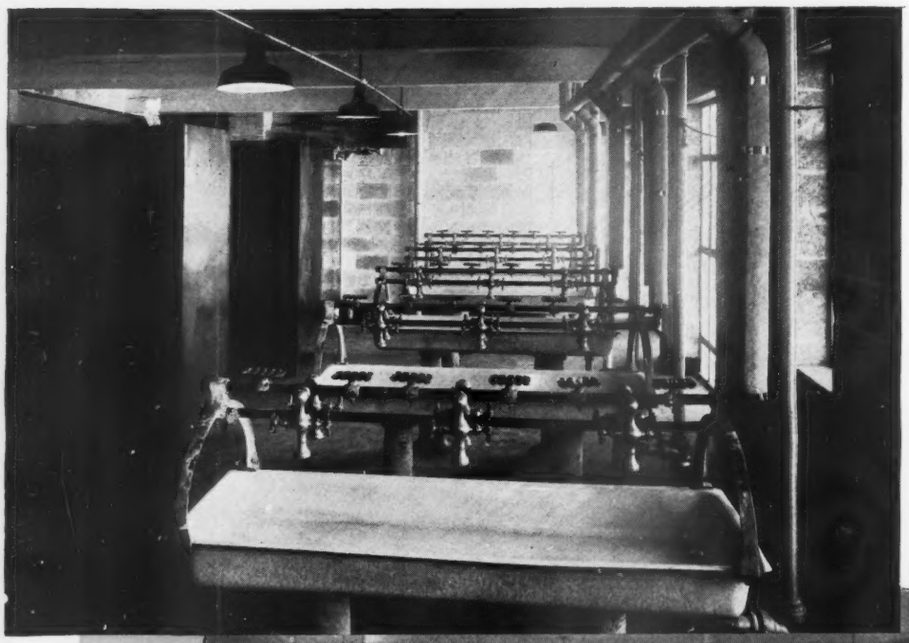
Since most material in the plant is non-combustible, there are no sprinklers.

The mezzanine locker room is equipped with enameled-iron group wash basins, and a triple tile shower.

At the front of the building are two wings. The smaller houses the boiler plant which applies steam for heating and other purposes.

The larger is the office. Here the most interesting and distinctive features are the windows which slant backward at the top. This construction is intended to cut down glare. Built-in cabinets under the windows inclose radiators and storage space. Spun-glass acoustical boards were applied to the ceiling to cut down noise. The floor is apitong, the same material used for the plant floor; it was applied here because it is quiet and comfortable.

Three sides of the building have been attractively landscaped in keeping with the country site. In the rear, a good-sized parking field has been provided.



MEZZANINE WASH-UP

Lockers and washroom are located on a mezzanine floor at the front of the plant. Enameled-iron wash basins of group type provide excellent clean-up opportunities. At one end of the room there is a tiled shower compartment with three showers for employees who insist upon more complete ablutions

SLOPING WINDOWS

Office windows are sloped to cut down the glare. Radiators are concealed in the space beneath the windows, and in the same space there are storage compartments. Acoustical board of spun glass is used on ceiling to absorb noise. Apitong floor is used not only in the office but also in the plant

DESIGNED FOR ENLARGEMENT to eight full stories, new 3-story addition at right is second that has been made to original structure. Present roof is a regular concrete floor, tar and gravel covered

NEW PLANTS OF 1939

News Syndicate Company, Inc.

PLANT AT BROOKLYN FOR THE BROOKLYN EDITION OF THE NEW YORK *DAILY NEWS*.
Engineers: Lockwood Greene Engineers, Inc., New York

WHEN A GREAT METROPOLITAN newspaper builds its plants, it builds them around its processes, as does any efficient manufacturer. And it builds its plants with an eye to future expansion.

An original six-story building to which a two-story addition had been made only a few years ago had become inadequate to house Brooklyn operations, and a second addition that would provide more press room and paper storage was decided on. What is particularly noteworthy is the fact that this addition is so designed that five additional stories can eventually be added to it to bring it up to full eight-story height.

Of reinforced concrete, flat slab design, the building is unusual in that the second floor, where press substructures are installed, can be reinforced wherever necessary to give it a loading capacity for 2,000 pounds per square foot.

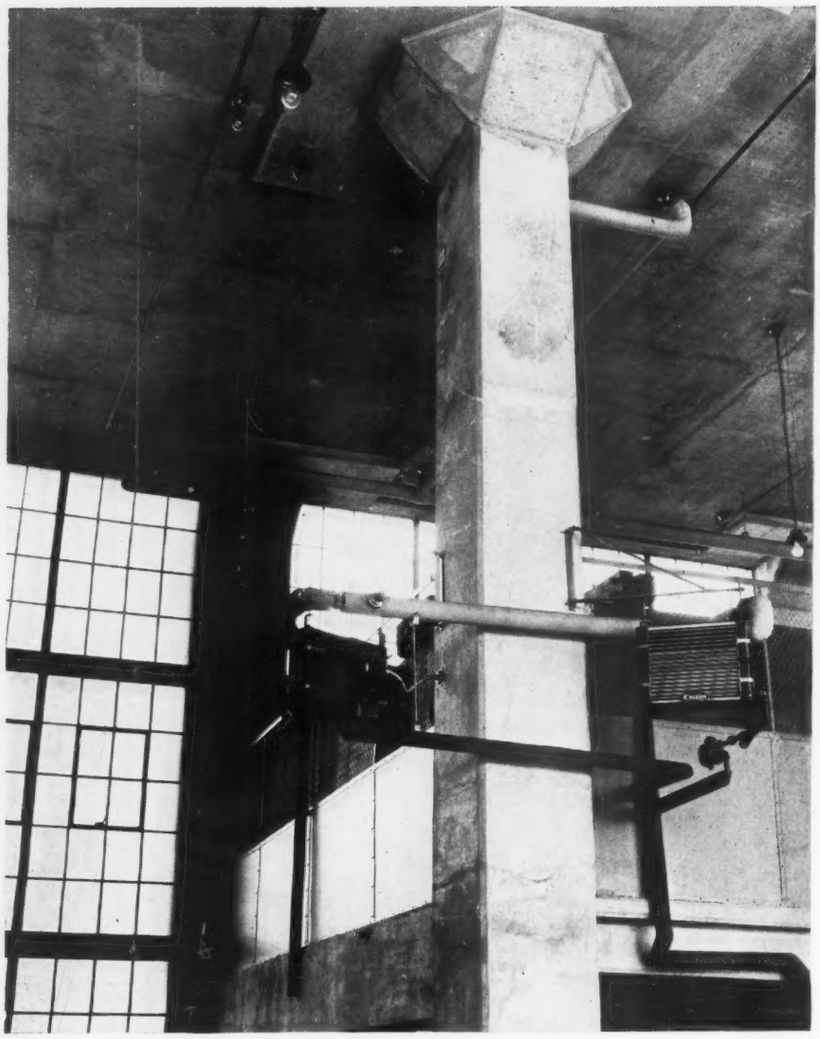
Except for stairways, the entire first floor is given over to mailing and shipping. Street frontage of the mailing room consists of a platform served by inclosed truck space accommodating delivery trucks. One truck station, at the extreme end, is used for receiving newsprint.

On the second floor are the press substructures and reels in which newspaper rolls are mounted and threaded up into the presses. This 30-foot-high floor contains a good-sized balcony, inclosed by steel and wire partitions, for storing spare press parts.

At the third floor level, the press-operating floor, the printing units join the press substructures.

A cleated conveyor takes incoming paper rolls from the loading platform as they come off the trucks, and carries them up an incline and along the reel room floor for the daily consumption. Rolls for future use are delivered at the far end of the old building and raised by finger-type conveyor to fifth and sixth floor storage.

Printing plates are cast in automatic machines in the stereotype foundry on the fourth floor, from mats delivered from the paper's Manhattan plant, where executive offices, editorial departments, and composing room are located. These plates, when ready for the press, are placed on a conveyor which



SECOND-STORY PRESSROOM, 30 feet high, has good-sized balcony for storing spare parts. Propeller-type unit heaters are mounted on supporting mushroom columns. All windows are equipped with pivoted, chain-operated ventilators

takes them to and along the presses on the third floor in both the new and old buildings, where they can be lifted off at any point of use. This conveyor also returns the plates to the foundry for remelting when the press is stripped at the end of a run.

From the reels in the press substructure on the second floor, the paper from the roll, known as the "web," travels automatically through the presses, folders, and, finally, by way of the "dispatch conveyors" to the mailing room. Here the finished papers are bundled on caster-mounted, steel-top tables which are rolled through doors to the shipping platform.

Building features include walls of brick and concrete and brick partitions. In the basement there is the pump room for ink thinner recovery completely inclosed by brick partitions to make it fireproof.

Steel-sash windows with pivoted ventilators, running almost the full height of floors, let in plenty of

CARRYING THE LOAD

Below, heavy steel beams, encased in concrete, support the floor of the pressroom located over this shipping department, make possible its load capacity of 2,000 pounds per square foot. Conveyors bring finished newspapers to shipping room. Wet-system sprinklers. Floors, hardener treated

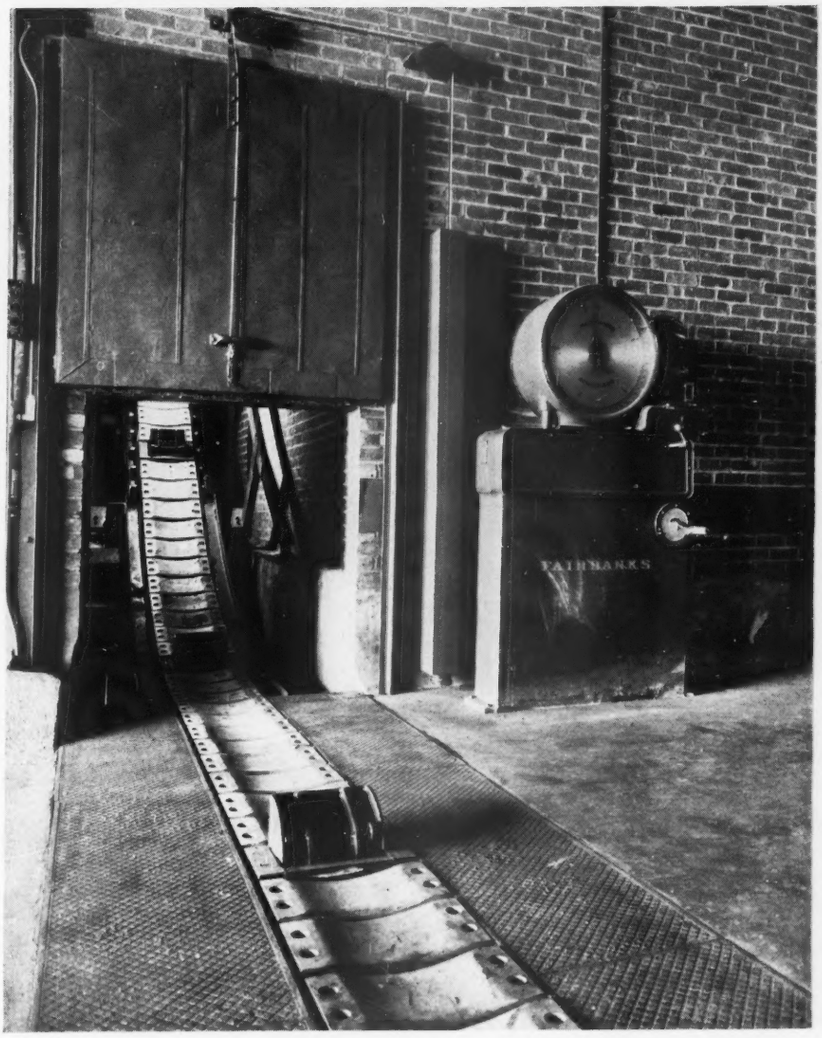
light in the daytime. For night operations, and to supplement daylight on dim days, there are RLM lighting fixtures.

Concrete floors, cement-finished, prevail in the plant. Around the presses, and making up most of the press-operating floor, are non-skid steel floor plates. Steel plates are also to be found forming an apron between the cleated paper roll conveyor and the loading platform.

Underwriter-approved fire doors shut off stairways and departments. Steel rolling doors can be lowered to inclose the shipping platform and truck stations from the street.

A wet sprinkler system and a telegraph fire alarm installation together with standpipe hose and first-aid fire extinguishers provide all-important fire protection.

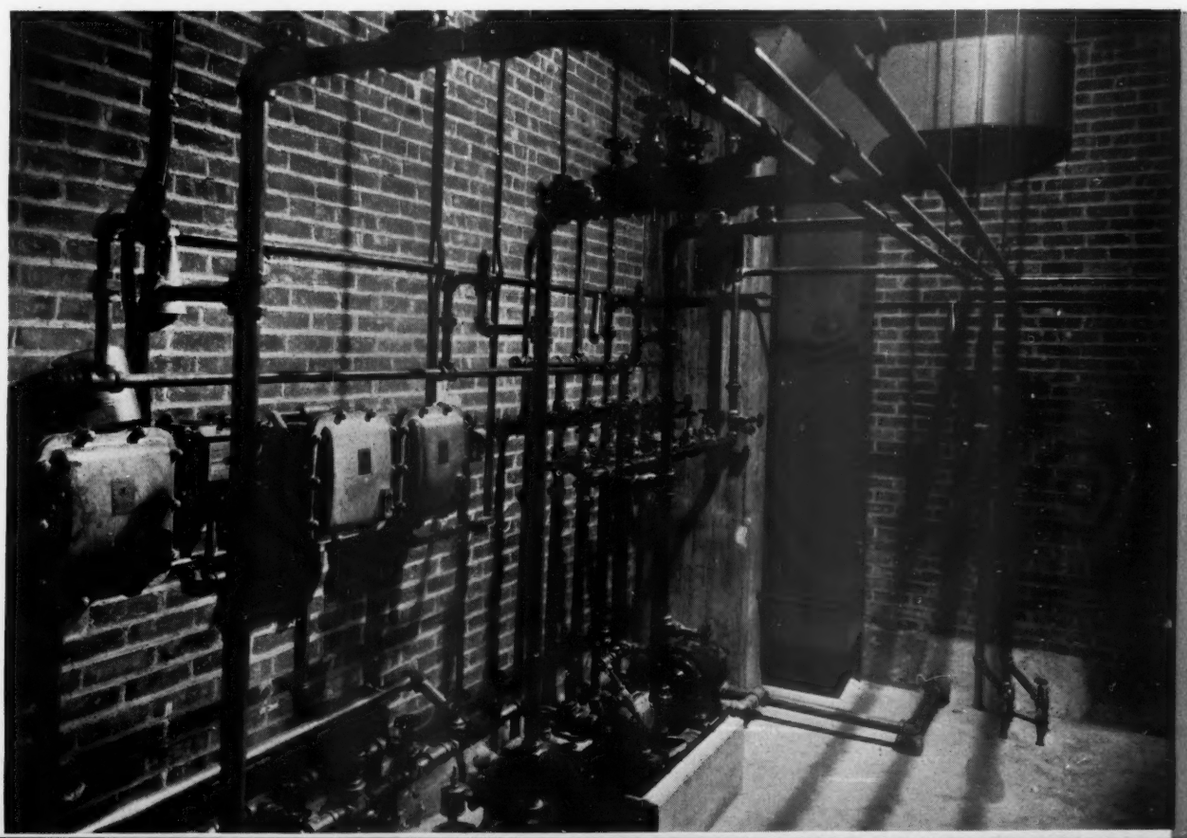
There is a low-pressure, vacuum return heating system; also, propeller-type unit heaters. Blower-type ventilating and exhaust fans remove heat, dust, and fumes from the press room.



CLEATED CONVEYOR moves rolls of paper from loading platform (left, not shown in photograph) to reelroom on second floor. Rolls are weighed on the recording scale. Counter-weighted door closes conveyor well in case of fire

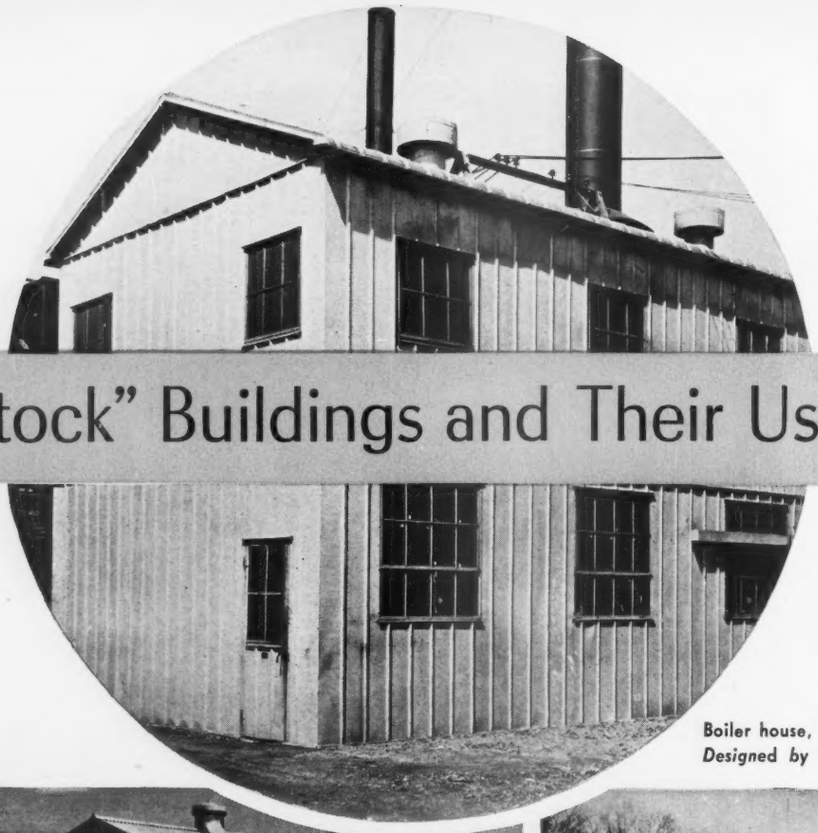
GUARDS AGAINST FIRE

Below, pumproom for the recovery of ink thinner in this big newspaper's Brooklyn plant contains every precaution against fire. All motors and controls are of the explosion-proof type. Along the fireproof walls are the discharge cones of the automatic carbon dioxide extinguishing system

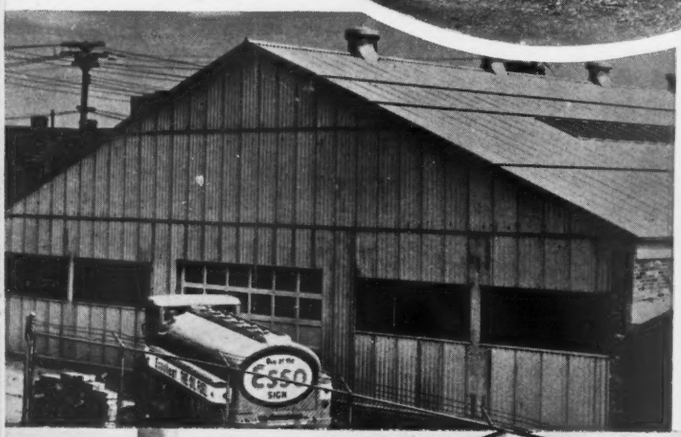


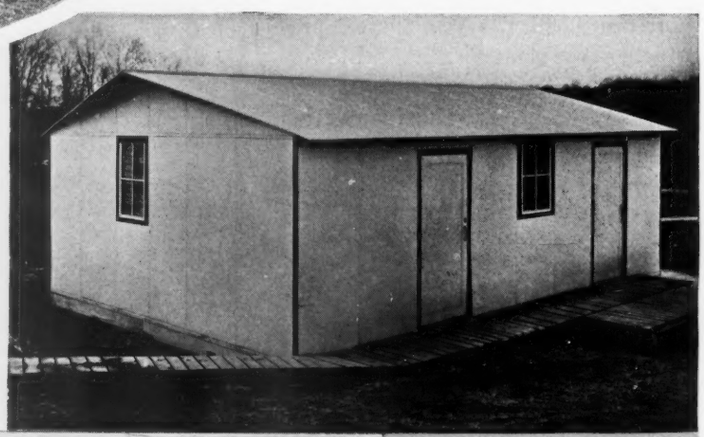
"Stock" Buildings and Their Uses

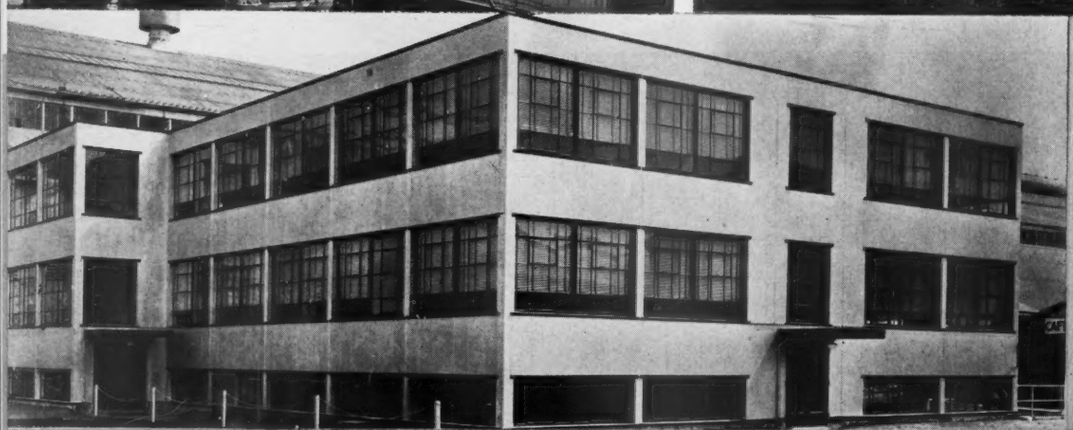
MANY INDUSTRIAL NEEDS can be well served by so-called standardized or pre-fabricated buildings. A wide variety of designs have been set up by manufacturers for both large and small structures. In general, all elements of such buildings are sent to the site completely fabricated and ready for assembly and erection. Among the advantages of this type of construction are low cost, ease and speed of erection, and the facility with which buildings can be taken down and put up in another location.



Boiler house, Weil Packing Company, Evansville, Ind.
Designed by Geo. L. Mesker and Company, Evansville





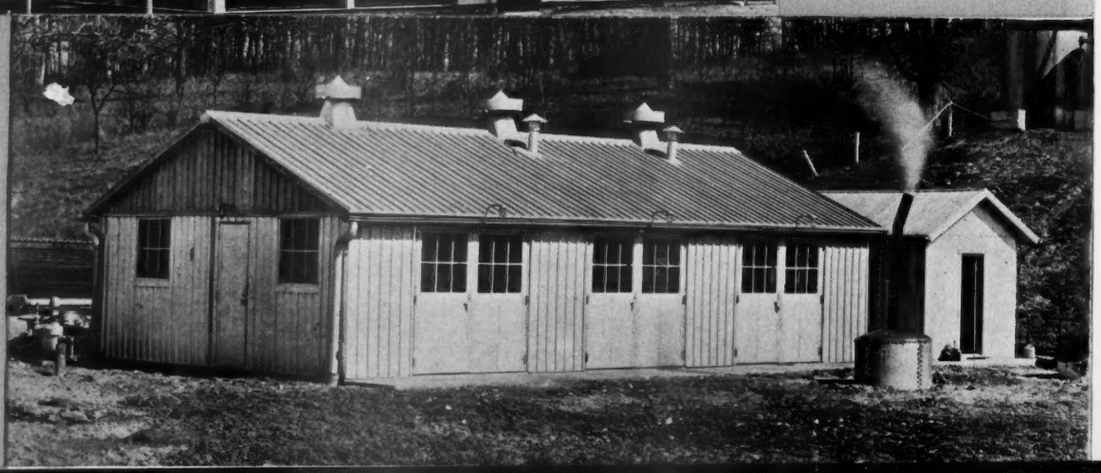


ABOVE, LEFT
General storage building, The Standard Oil Company
Designed by Maryland Metal Building Company, Baltimore

ABOVE
Storage building at the Cardox Corporation, Meadowview, Va.
Designed by Dry-Zero Corporation, Chicago

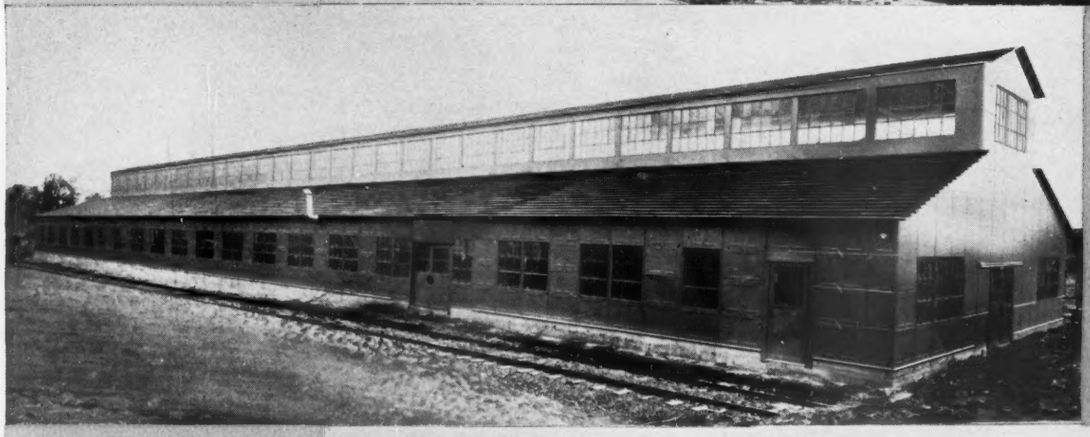
ABOVE
Main mill office building at the Irvin Works of Carnegie-Illinois Steel Corporation, Pittsburgh
Designed by Tennessee Coal, Iron, & Railroad Company, Birmingham

RIGHT
Pumping station, Gas Producing Company of Ohio, Somerset, Ohio
Designed by The International Derrick and Equipment Company, Columbus



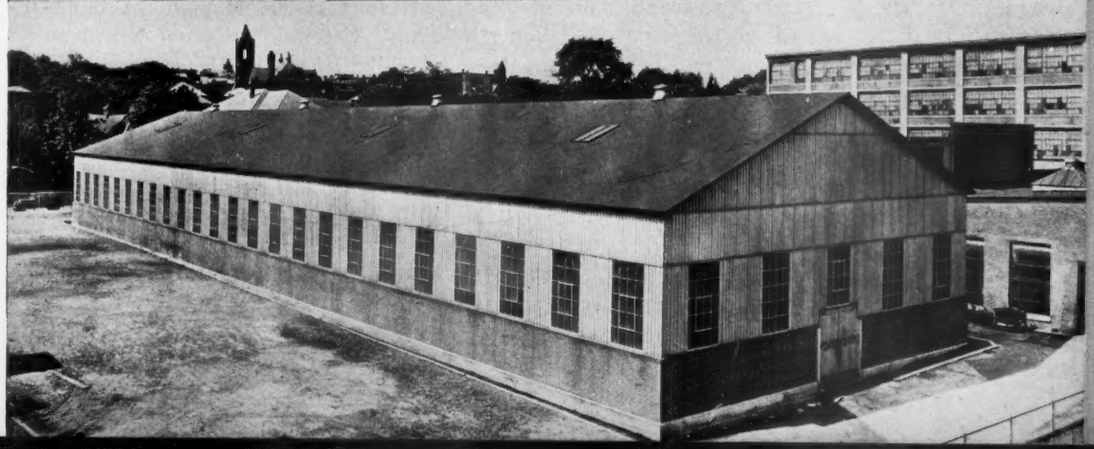
Board plant building, National Gypsum Company, Inc., Port Wentworth, Ga.
Designed by The Ingalls Iron Works Co., Birmingham

Port warehouse building, Port Isabel, Tex.
Designed by International Steel Company, Evansville

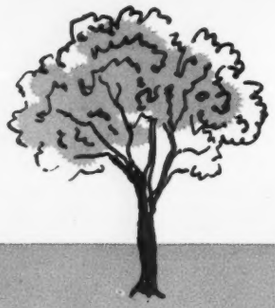


S. W. Lentwieler Building, Richmond, Va.
Designed by Truscon Steel Company, Youngstown

Refinery shop and warehouse, Wilshire Oil Company, Los Angeles
Designed by the Butler Manufacturing Company, Kansas City, Mo.



Plant building, Crompton & Knowles Loom Works, Worcester, Mass.
Designed by Blaw-Knox Company, Pittsburgh



ARTHUR S. BERGER, LANDSCAPE ARCHITECT, TOLEDO

Landscaping Makes the Building Look Its Best

FRAMING THE PICTURE. A matched pair of Mugho pines flank the entrance to the research building at Libbey-Owens-Ford Glass Company, Toledo. Evergreens are the landscape gardener's choice because they are effective the year round

LANDSCAPING A FACTORY site has only one aim—to provide a proper setting for the plant, to blend it into the site that it occupies.

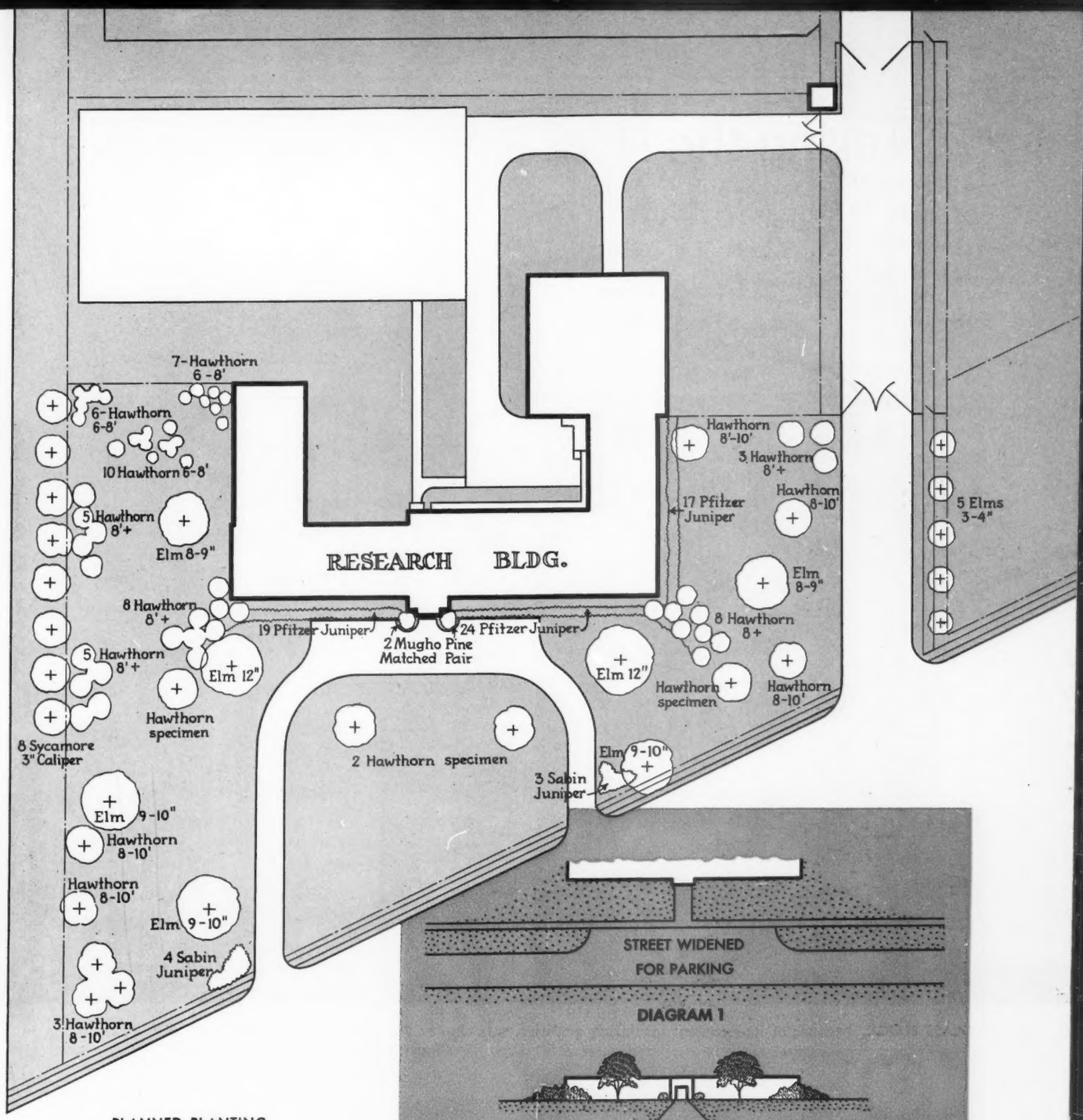
All gardeners and nurserymen have ideas as to what to plant and when, but the landscape architect goes many steps beyond elementary phases. He is concerned with the placing of the building on the site, with the location of roads, approaches, parking areas, retaining walls, grades, and many other things besides the actual planting itself. Landscape architecture is primarily planning, of which planting is only a component part.

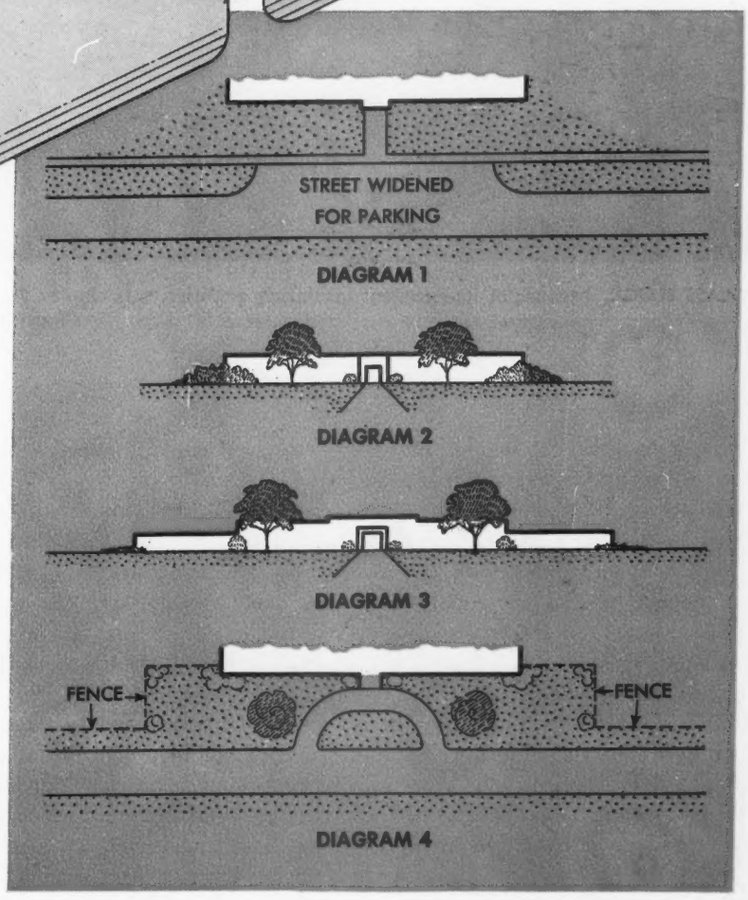
Fixed rules on landscaping a factory site are as difficult to establish as rules on landscaping a country estate, but certain fundamentals can be applied.

A factory can be made to blend into the surrounding topography by wise use of tree and shrub masses. The lines of a factory can be accentuated or diminished, lengthened, heightened, or changed; the setting can be made to appear deeper or smaller; the entire effect can be brightened or diminished by the way the site is landscaped.

Placing the building on the site is the joint responsibility of the architect and the landscape architect. In other words, the landscape architect's task begins when the building architect begins to plan the buildings. Often not only one but many buildings must be placed, so the relation between groups must be studied. Unhampered flow of materials from one manufacturing process to another, the circulation of deliveries,

(Continued on page B127)





PLANNED PLANTING

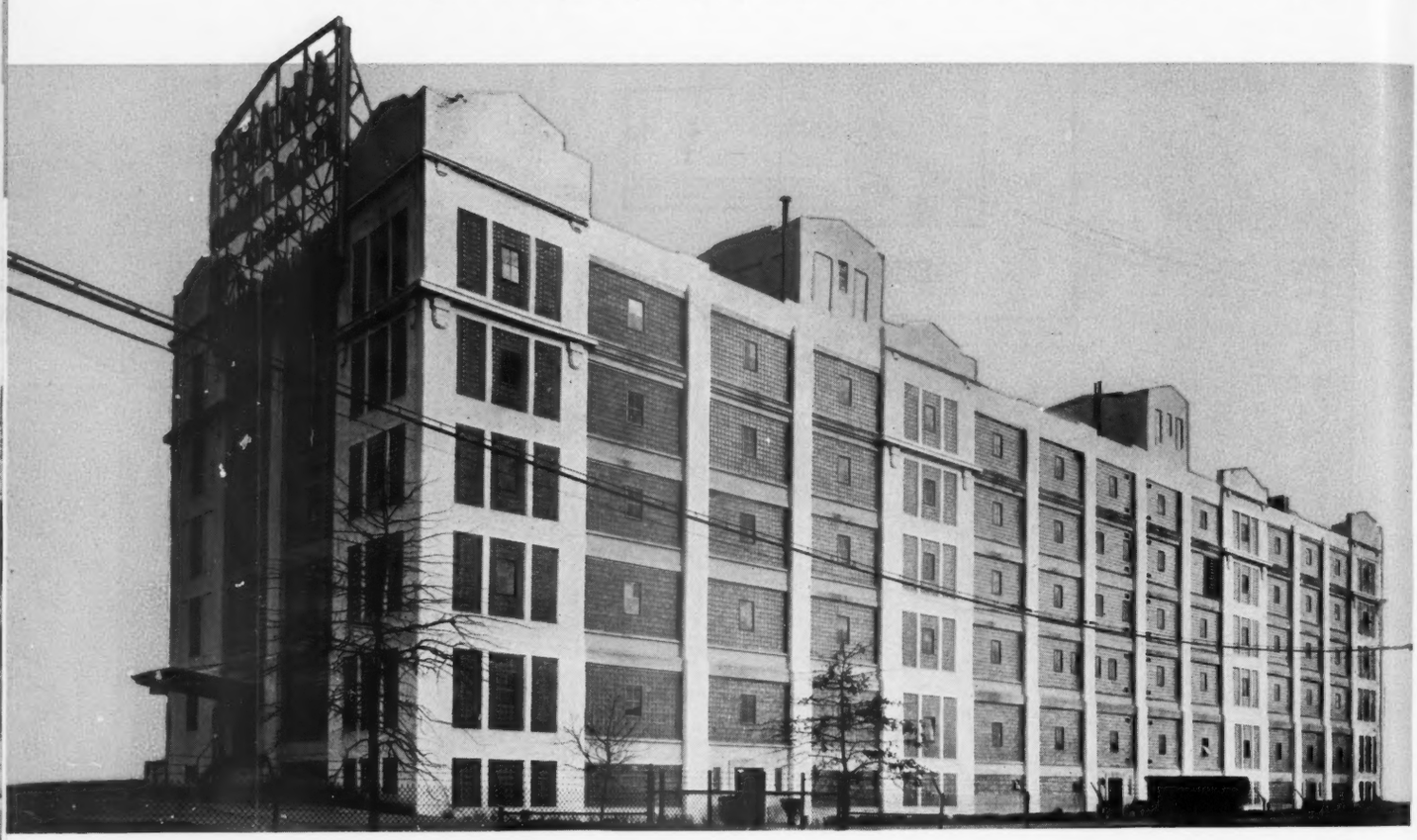
Above, planting plan for research building shown on opposite page. Careful attention has been given here to foundation planting, also to effective placing of specimen shrubs and trees. Trees at corners tend to soften harsh vertical lines. Pine, spruce, fir, and holly are excellent evergreens for this use if soot and smoke are not a hazard. Among deciduous materials, hawthorns are outstanding for this purpose, both because of their dense growth and ability to thrive under city conditions

POINTERS

Right. (1) How street may be widened to permit parking in front of plant. (2) Here planting emphasizes entrance as integral part of whole. (3) Lowlying shrubs at far ends strengthen idea of horizontality. (4) Good use of fence

Taking the Date Line Off the Old Plant

Some of the things that date a plant: Floor areas broken up by close spacing of columns, cracked walls, warped or rusty sash; hole-in-the-wall entrances, rough floors, poor-quality lighting, dirty walls and ceiling, inadequate heat



GLASS BLOCK, because of its excellent insulating qualities, was chosen to replace windows when Bristol Myers Company air-conditioned more and more operating departments. Thus a plant that was not old became a better, more modern one

G. A. VAN BRUNT, ASSOCIATE EDITOR

YOU MAY BE one of the great number of plant owners or managers who are trying to decide what to do about providing a more efficient layout, better working conditions for employees, and other facilities that look modern and are modern. Probably the old plant buildings are in pretty good, even excellent, condition. Buildings that have been strongly constructed and well maintained have almost indefinite life. But you know that strong construction and good condition aren't the only features that count, and you are conscious of many shortcomings in the old buildings.

Granted that they were well suited in every way to the manufacturing requirements of, say, fifteen or twenty years ago, the story is different now. Size and weight of machines, and combinations of machines, have increased greatly in many industries, and to a considerable extent in practically all. The result is much heavier floor loads.

Ideas and practices in plant layout have undergone radical changes during the past few years.

Conveyors, power trucks, hoists, and other materials handling equipment have replaced strong arms as the means of transporting materials and parts around the plant.

These changes tend to put a premium on floor areas that are not obstructed by building columns, and roof structures heavy enough to carry overhead conveyors and other handling equipment.

Widespread adoption of humidity and temperature control, in many instances complete air conditioning, has brought up problems in the con-

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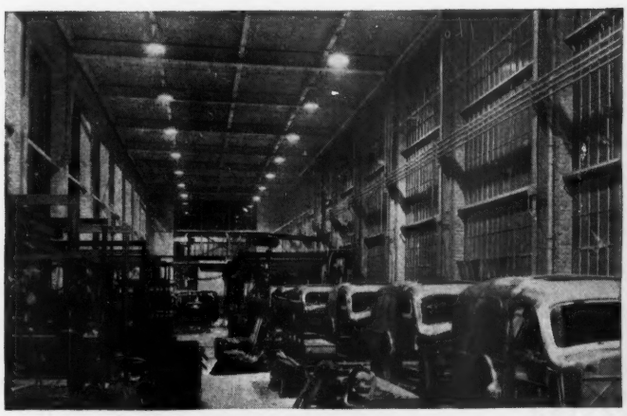
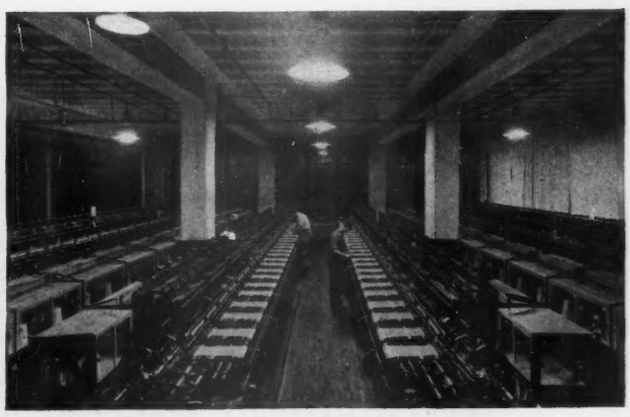
High reflectivity is obtained by a special electrolytic treatment of polished Aluminum sheet. This surface is protected by a smooth, oxide coating of glass-like hardness, to which dirt does not cling. It won't chip, doesn't scratch easily and can be readily cleaned by washing with soap and water.

Alzak Reflectors cover a series of finishes. Some are intended for indoor use. Others are able to withstand out-of-door exposure and the corrosive conditions encountered in certain industrial processes. You can have bright, specular finishes or matte, diffuse surfaces.

Whatever your use, *specify the right Alzak finish.* Write to any of the companies listed for further information or address your letter to us.





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trol of heat losses and gains to which little or no attention was paid a few years ago.

Lighting intensities formerly recommended as adequate have been raised to several times their old value.

Laws passed within recent years have imposed new sanitary and other regulations affecting employees' safety, comfort, and well-being.

A well-designed new plant would automatically solve all these problems, and provide the facilities and conditions requisite for topnotch efficiency. But for financial or other reasons it may not be possible to put up a new plant. When that point is once definitely settled, the question then arises, *What can be done to bring an old plant up to modern standards?*

Everyday experience shows that in most instances a heavy percentage of the changes desired can be made at a cost that can be justified by the results. In any event, the possibilities are well worth the most careful investigation.

By way of illustration, in some instances all floors and columns of buildings have been removed and only the walls and foundations retained, everything else above the ground level being completely rebuilt. On the other hand, in cases where the walls were in poor shape, but foundations, columns, and floor framing were adequate and in good condition, these elements have been retained and the outside walls completely remodeled. In this way it was possible to increase window areas greatly and improve the appearance in striking fashion.

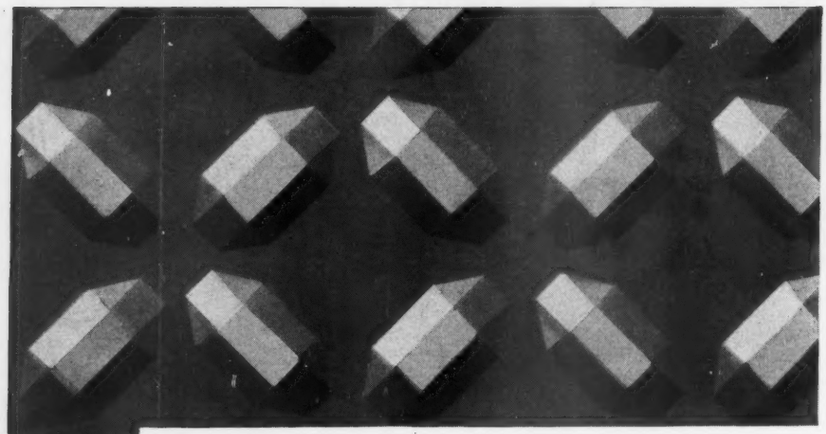
Stories Can Be Added

When more floor space was needed, it has been found possible to add one or more stories to a building that was not designed originally to carry them. If foundations are adequate, as they will be if they are laid on rock or hard pan, it may be a fairly simple matter to strengthen the columns sufficiently to carry the additional load. There have been other instances where the roof or top story of a building has been jacked up a sufficient distance to permit adding one story, practically without interrupting production while these changes were being made.

Minor structural changes that can usually be made without much difficulty include removal of an occasional column or even an entire row of columns by the substitution of floor girders or roof trusses, or both; replacement of dividing walls (where these were not required as firewalls) by columns and girders; increasing story height by raising the roof level and inserting longer columns; increasing daylight in top stories by the addition of skylights.

These changes in the physical structure of plant buildings have been cited to show some of the possibilities. Certainly they indicate that almost any desired alteration in a building can be made.

Before discontent with the old plant can be translated into action, a careful study of the situation must



A WORK FLOOR PATTERN

To Guard the Danger Zones In Your Plant . . .

WHEREVER men walk or work, where a tumble or fall might result in a serious accident, where industrial trucks must move safely and quickly, that's where you can put U·S·S Multigrip Floor Plate to work for you.

Look at the close-up view of a section of Multigrip. You can easily see that it is designed for safety. It's studded with risers, at right angles to one another, to assure positive traction in every direction. Flat on top, these risers are comfortable underfoot. They tend to eliminate fatigue and increase workmen's efficiency.

Write or phone any of the companies below for complete information about Multigrip. There's no obligation.

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United States Steel Export Company, New York

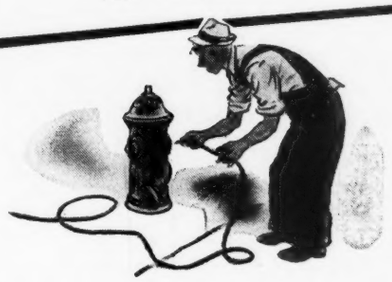
UNITED STATES STEEL

Management ends $2,399 power loss as result of wiring survey

(At right) Industrial analyzer in use. Equipment like this can help you save money.

Charts from a graphic meter used in a wiring survey by a large industrial concern showed that a power factor of 70% with all machines in operation was causing low voltage trouble at motor terminals. The survey revealed that by raising the power factor, a saving of $705 a year could be made; that the increased energy consumption of too-large motors could be eliminated, thus saving $1,152 a year; and that interest and depreciation charges on excess motor capacity amounting to $542 could be saved—a total of $2,399.

Photo courtesy Westinghouse Electric & Manufacturing Co.



You wouldn't run a ½" hose to a fire plug—why not have motors and wiring exactly right?

Inadequate wiring responds to overloading just as a small diameter hose on a pressure line does. Power lines are choked; then fail completely. But, because power "leaks" are invisible, power losses continue unnoticed until they mount up to thousands of dollars a year.

Nine out of every ten industrial plants in the country, authorities say, are paying out money needlessly due to power losses that could be stopped simply by rewiring circuits. And as power losses increase, breakdowns are liable to occur. Just one breakdown from overloaded circuits, with subsequent plant tie-up, can cost far more than wiring modernization.

A survey of circuits costs nothing! Your contractor will help you make this wiring survey

Your regular electrical contractor is equipped to make a wiring survey for you. He knows how to use the "Industrial Wiring Survey" which tells how to check up circuits and the "Industrial Guide" which tells how to correct the conditions found. Consult him when making your survey.

ANACONDA
from mine to consumer

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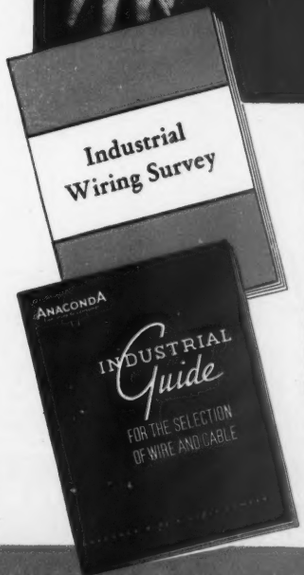

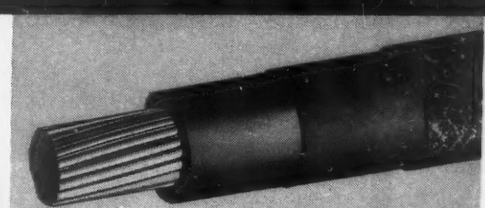

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MEDART COMPANY ... Improves Production with SLY Blast Cleaning and DUST Control Systems

The Medart Company of St. Louis, manufacturers of power transmission machinery and appliances, had a combined blast cleaning and dust control problem. They needed equipment to clean their various castings prior to machining (since any sand remaining from the casting operation dulled machining tools); and they had to have equipment to keep the plant free from dust.

So they purchased a complete Sly Blast Cleaning System including an 8' x 12' Blast Room, Pressure Blast Tank and Sly Purair Helmet. This blast cleaning system resulted in improved finish of the castings, greater accuracy in machining and economy in production.

They installed also a Sly Dust Filter to eliminate the dust resulting from various plant operations. The filter created better working conditions for the men and effected savings in many ways.

This is only one instance of hundreds where better working conditions and savings in production have been brought about by Sly Equipment. If you have a blast cleaning or a dust problem, it will pay you to consult us. The accumulated experience of 66 years is at your disposal when you have a Sly man on your particular problem.

A TYPICAL SLY DUST FILTER INSTALLATION

On roof of an industrial building. Exhaust fan and motor are located on floor below. Dust laden air enters filter through dust pipes shown on left. Air leaving the exhaust fan in room below is free from dust.

★

THE W. W. SLY MANUFACTURING CO.

Branch Offices in Principal Cities

4755 TRAIN AVENUE • CLEVELAND, OHIO

be made from three standpoints.

It is a good idea first to make an ideal layout for the manufacturing processes. It is to be presumed that it will not be possible to put such a layout into effect in the existing building or buildings. When it is compared with the present floor plan, however, you will get a clear picture of what compromises will have to be made and the building changes that will be necessary in order to get the best layout possible under the circumstances.

It was said before that in general practically any desired change may be made in a building. Therefore the problem, so far as layout is concerned, becomes mostly a matter of weighing the cost of desirable changes against the savings and benefits which they will give.

Checking the Exterior

Next in order is a thorough inspection of the exterior of the structure to determine: (1) What repairs are necessary to put it into proper condition; (2) alterations that are desirable from the standpoint of improving the appearance; (3) changes designed to increase employee comfort and welfare, and increase the efficiency of operation.

Suppose we consider for a moment some of the points that must be covered in the inspection of the building itself. We may as well start in by examining the foundations and piers for cracks or evidences of settling. Excessive settlement is often caused by the soil washing out and may require preventive measures whose natures must be determined for each case.

Extreme dampness of basement walls and floors usually indicates that drainage is not adequate. When it is improved by the adoption of suitable measures, the dampness will tend to decrease.

If the addition is severe enough to interfere with use of the basement, the walls can be treated with any one of several preparations that will help to keep moisture from coming through. When conditions are very bad, however, waterproofing by means of a membrane swabbed onto the exterior surface

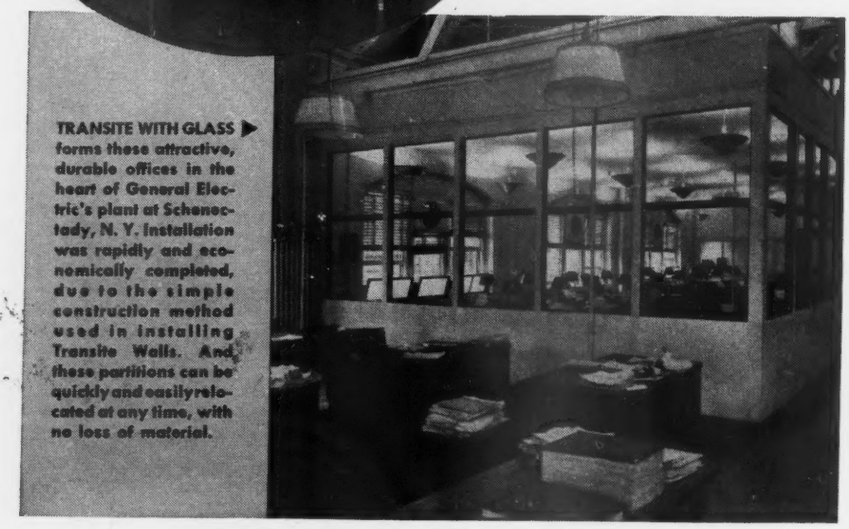
Photo shows the Super-Diamond Pattern of "A.W." Rolled Steel Floor Plate. Provides safe tread from any angle, under any condition.

On busy floors . . . "A.W." Rolled Steel Floor Plate is a practical solution to floor maintenance problems on busy traffic aisles, stair treads, factory floors and refinery towers. With "A.W." Floor Plate, the first cost is always the last cost. Oil-proof, heat-proof, crack-proof . . . permanently safe. No worn and slippery surfaces to endanger men on foot. No cracks or ridges to upset floor trucks. Can be cut to any shape and installed *almost over-night*—that isn't a catch phrase, it's a fact. Write for folder.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS, CONSHOHOCKEN, PENNA. : : SINCE 1826 : : DISTRICT OFFICES AND REPRESENTATIVES—Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, New Orleans, St. Paul, Pittsburgh, Roanoke, Sanford, N. C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal—A. C. Leslie & Co. PRODUCTS INCLUDE—Steel Products in Carbon, Copper or Alloy Analyses : : Sheared Steel Plates : : Hot Rolled Sheets and Strip : : "A.W." Rolled Steel Floor Plates : : Billets, Blooms and Slabs . : "Swede" Pig Iron : : Reading Cut Nails.

NO SUGGESTION of a factory is given by this conference room, yet it is actually located in General Electric's Pittsfield, Mass., plant. Quiet and privacy are assured by the use of Johns-Manville Transite Walls.



TRANSITE WITH GLASS ▶ forms these attractive, durable offices in the heart of General Electric's plant at Schenectady, N. Y. Installation was rapidly and economically completed, due to the simple construction method used in installing Transite Walls. And, these partitions can be quickly and easily relocated at any time, with no loss of material.

From Conference Room to Plant Offices

GENERAL ELECTRIC BUILDS with J-M TRANSITE WALLS

Steadily growing industrial trend toward these movable asbestos-cement partitions marked by 15 installations in various G. E. plants since 1933

GENERAL ELECTRIC, like scores of other leading manufacturers, is using J-M Transite Walls to meet a wide variety of partitioning requirements. This modern wall material is particularly adapted for use in factory offices as well as in general factory areas, for it combines complete fire-safety with unusual durability and low maintenance. Offices are as solid and private as though permanent partitions had been used, yet, because of their unique construction method, Transite Walls are erected in a fraction of the time. And, when changes are necessary, they may be quickly, easily relocated with complete salvage of materials. For further information, write for new Transite Walls brochure TR-22A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville

TRANSITE MOVABLE ASBESTOS WALLS

of the foundations with a bituminous compound may be required.

At the same time it will probably be necessary to cover the existing floor with a waterproof membrane, swabbed on, and lay a new floor over it.

Inspection of exterior walls usually discloses more or less cracking which is caused either by shrinkage, or by settlement, vibration, or expansion and contraction. It is common practice to fill cracks caused by settlement or vibration with an elastic calking compound. Cracks caused by shrinkage are filled with a cement-mortar mixture. Defective mortar joints are treated in the same way.

Window heads and sills, parapet walls, coping stones and all such points need close inspection and careful repair.

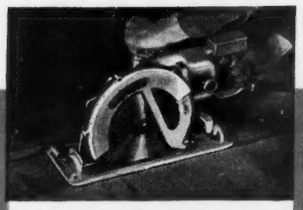
Methods of calking and the results obtained have been greatly improved during the past few years by the development of better guns and calking materials.

Waterproofing for Walls

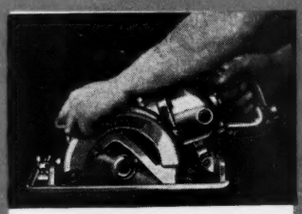
Excessive absorption of moisture by walls is highly undesirable and may lead to serious damage. The remedy lies in the application of some suitable waterproofing compound, of which a number are available, including excellent transparent coatings which are virtually colorless.

Concrete buildings that are, say, fifteen or twenty years old frequently show considerable spalling caused by moisture getting into hairline cracks and freezing, or by corrosion of the reinforcing rods. When such conditions exist, it is necessary to cut out all loose material and carefully patch the defective spots. Then the entire structure should be protected against further deterioration by a good waterproof paint.

While the walls are being inspected, the sash will of course come in for attention. Wood sash is likely to warp and crack after years of service, becoming unsightly and leading to serious loss of heat. If anything more than painting and puttying is required to put it in



HANDLES as easily as a hand saw. Stanley W9 Safety saw. Ideal for heavy plant construction. Capacity 3¼".



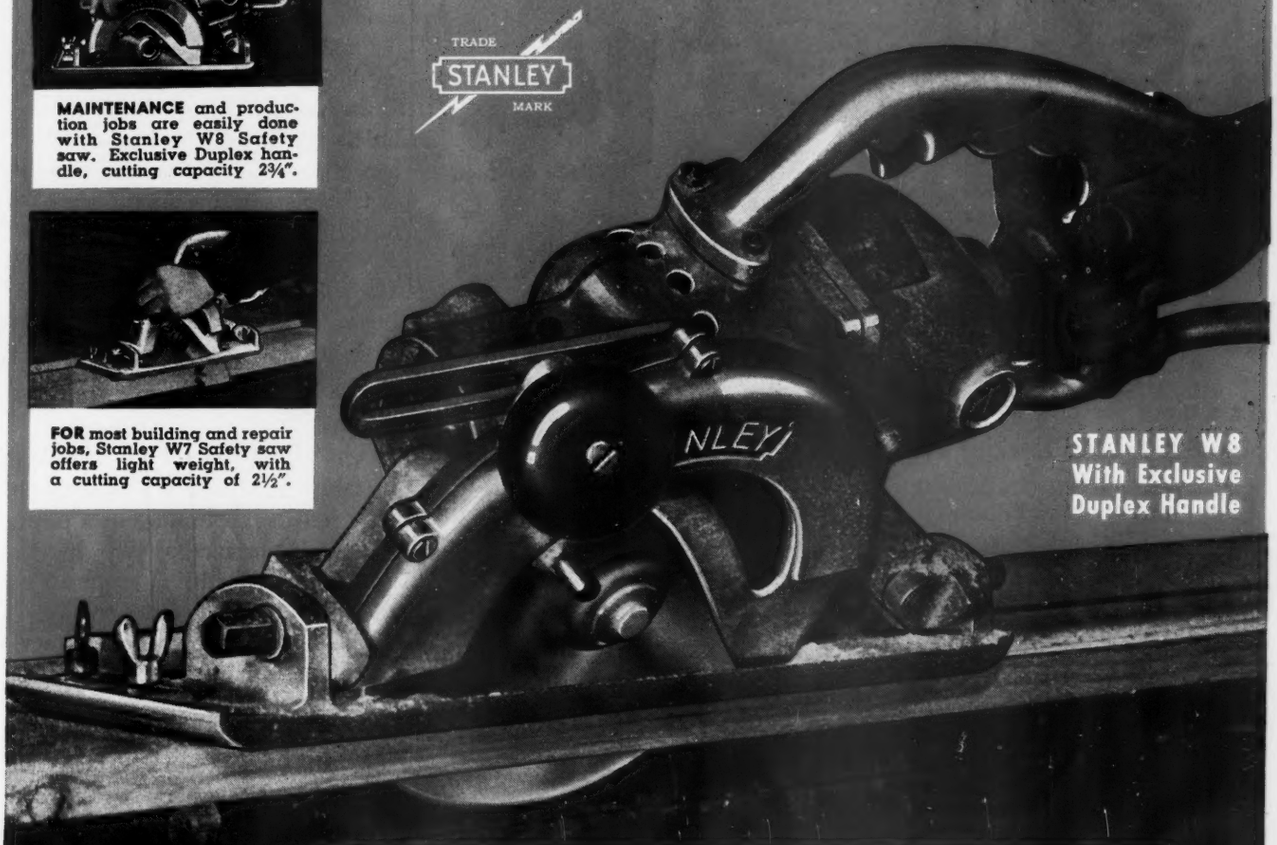
MAINTENANCE and production jobs are easily done with Stanley W8 Safety saw. Exclusive Duplex handle, cutting capacity 2¾".

FOR most building and repair jobs, Stanley W7 Safety saw offers light weight, with a cutting capacity of 2½".

Safe . . .

And Easiest to Handle

TRADE STANLEY MARK



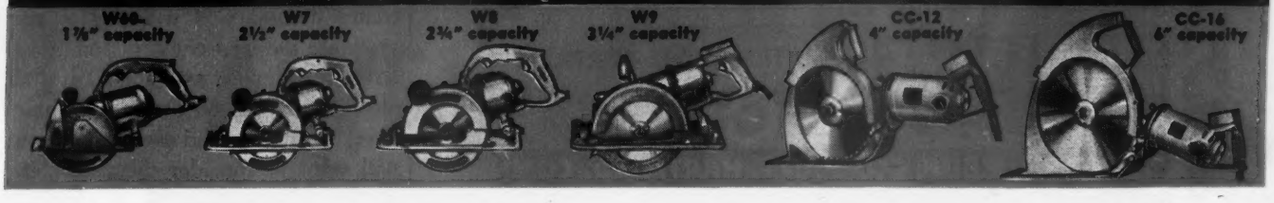
STANLEY W8
With Exclusive
Duplex Handle

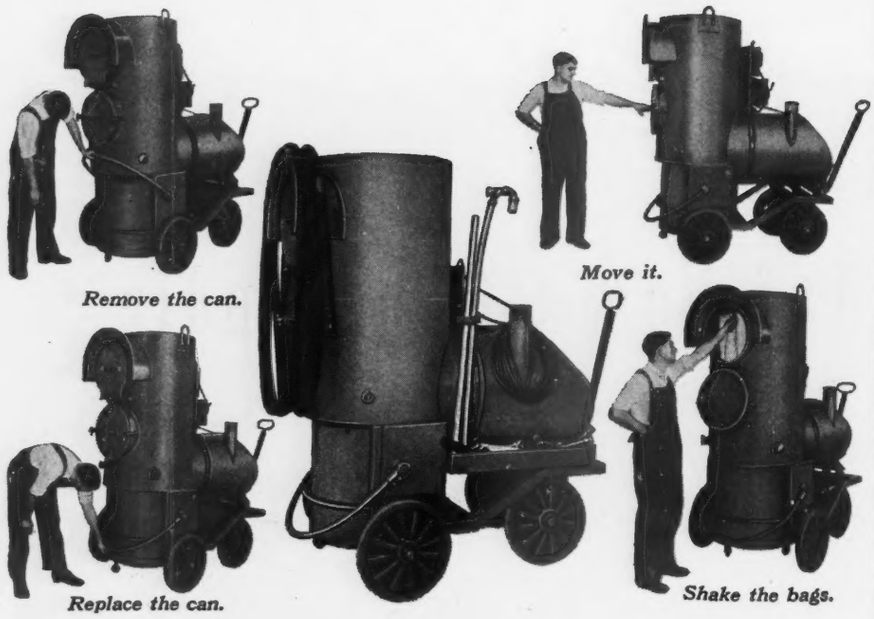
UNUSUAL SAFETY features, and ease of handling, are built into Stanley Electric Saws. From the CC-16, the largest portable electric saw made, down to the powerful, light-weight W60, the Stanley Line offers a saw for every job.

Ask your Stanley distributor for demonstration, or write for literature. Stanley Electric Tool Div., The Stanley Works, 151 Elm St., New Britain, Conn.

STANLEY SAFETY SAWS

A Complete Line For Industry — "Cost Less Per Year"





THIS SUPER-VACUUM CLEANER

is manipulated with one hand!

It's a giant for power—two men can sweep at a time with 7½ horse power in vacuum back of every move of the tools.

It's a giant for dirt capacity—7½ cubic feet—enough for a day in most plants, and the dirt can is easily moved, rolled on its own casters, emptied and replaced.

Read these specifications for a large capacity and serviceability in Spencer Vacuum Cleaning never available on wheels before.

CAPACITY: 7½ HP. Dirt Capacity 7½ cubic feet (750 lbs.). Vacuum 2" Hg. at end of 50 foot hose with a 1⅛" orifice. Blocked off: 5¾" Hg.

DIMENSIONS: Height 81½", Width 37½", Length 75½", Weight 1500 lbs.

VACUUM PRODUCER: 60 cycle, 3450 RPM. Direct connected motor (impellers on motor shaft). Only two bearings to lubricate. 25 or 40 cycle with belt drive.

SEPARATOR: Large filter area in the tubular bags. Held in place by spring steel ring, easily removed for inspection.

SPECIAL FEATURES: Hand shaker makes it unnecessary to rap each bag separately. Two inspection doors of liberal size. Four 18" wheels mounted on roller bearings. Pull handle for one man operation or tractor and ring for handling with crane. TOOLS and HOSE: Standard Spencer industrial tools and hose. Spencer swivel handle provides easy manipulation.

DEMONSTRATION: This new equipment will be demonstrated in your plant without obligation, by our nearest representative.

182-A

SPENCER HARTFORD CENTRAL AND PORTABLE VACUUM CLEANING SYSTEMS

THE SPENCER TURBINE COMPANY, HARTFORD, CONN.

good condition, the advisability of replacing it with steel sash should be looked into. In that event it will be desirable and probably possible to use larger windows, thus allowing for light to enter. At the same time the reduction in blank wall area will snap up the appearance of the building.

Use of glass block also gives a modern touch and because of its insulating quality, heat gains and losses can be greatly reduced. This is an important consideration in air-conditioned areas. Glass block has the additional advantage of requiring little maintenance.

Entrances to many old plants are little more than holes in the walls; hence they offer a fine opportunity to take years off the appearance of a plant. By skilfully combining the different elements and materials now available, it is possible to design entrances that will blend harmoniously with the structure as a whole and create a distinctly favorable impression.

The Importance of Roofs

Roofs usually do not have much effect on the appearance of a plant, but the importance of their service makes them worthy of more attention than they sometimes receive.

Old plants may have one of several types of roofs, but the one most commonly found consists of a waterproof covering composed of several layers of impregnated felt mopped on with asphalt over a wood deck.

If this covering shows any defects, such as bulges, separation of layers, or tears, they should be properly repaired at once. Flashings need special attention, because they are frequently the location of leaks that are sometimes difficult to locate.

Look carefully also into the condition of the roof deck. Leaks and condensation frequently cause serious rotting of wood decks.

When replacement of the roof becomes necessary it will pay to investigate the new constructions that have been made available. If the old deck is in good condition a new covering may be laid over it, but you will want to consider the advisabil-

NATIONAL DISTILLERS

2 ADVANTAGES

YOUR PLANT—large or small—can profit from "endless stream materials handling." Whether in production, packaging or warehousing—greater economies can be effected by eliminating non-productive efforts and applying efficiency principles.

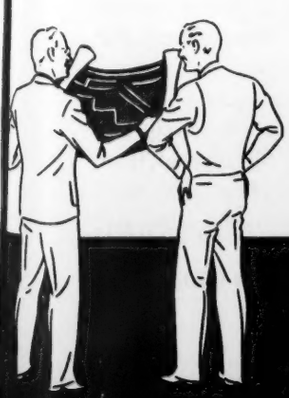
Designs for *today's high-efficiency requirements* must also be flexible to *meet future demands*—and Alvey-Ferguson Engineers are well equipped with over forty years experience to help you secure the advantages accruing from efficiency—plus flexibility.

Look, for instance, at National Distillers' plant. Highly efficient today, this "Scientifically Planned" layout will permit equal efficiency under demands of the future. Materials enter one end of the plant, and packaged products stream out the other—at the rate of 18,750 cases a day!

Everything enters and leaves by conveyors. Gravity and Power Conveyors traveling 150′ per minute serve the bottling, shipping and storage areas. Six packaging lines (Belt Tables and Overhead Empty Carton Belts shown above) are designed to handle every size bottle from miniature to quart. In addition, variable speed drives permit pace changes for various size and style containers. Any one of these lines may be easily converted to handle any size!

Whatever your particular problem—large or small—the competent advice of an Alvey-Ferguson Engineer is yours for the asking. There is no obligation on your part for this counsel service extending from coast to coast. Write today to The Alvey-Ferguson Co., 103 Disney Street, Cincinnati, Ohio.

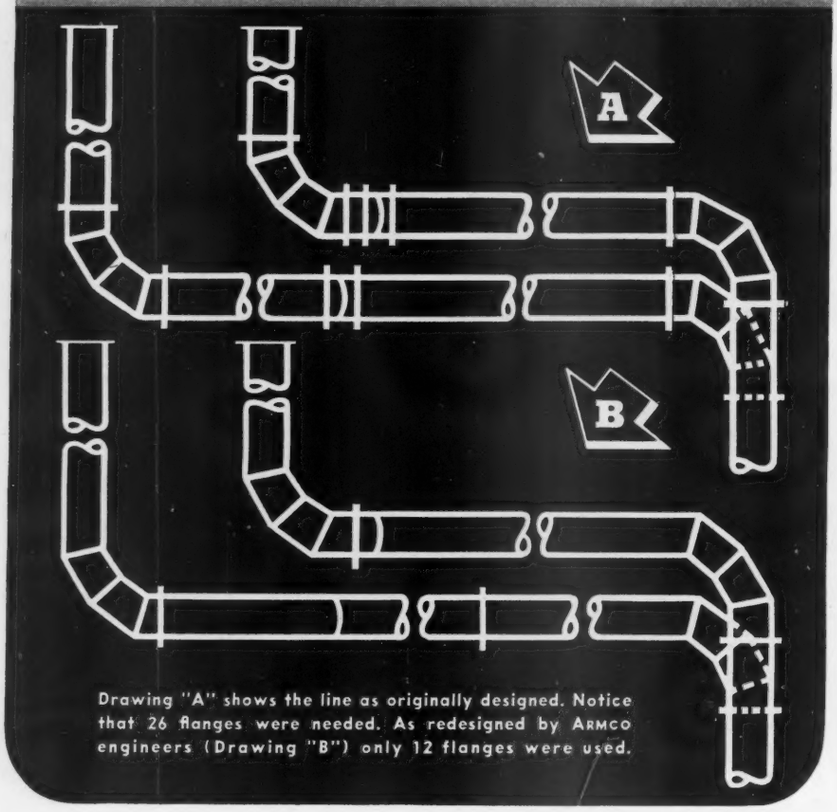
***FREE**—To Executives. A new catalog that graphically shows you the correct answers to many materials handling problems. Write for it—today.*



ALVEY-FERGUSON

CONVEYING A F MACHINERY

INQUIRY SAVES 24% ON ONE PIPING JOB



Drawing "A" shows the line as originally designed. Notice that 26 flanges were needed. As redesigned by ARMCO engineers (Drawing "B") only 12 flanges were used.

• Here is the true story of a purchasing agent who asked to be shown... and saved time and money for his company as a result.

He had heard about the possibilities for saving with ARMCO Spiral Welded Pipe. So when new pipe was needed he sent the plans to ARMCO.

A few changes in design brought a saving of 24%! By using longer lengths of ARMCO Pipe, shop-fabricated fittings and fewer joints, the cost was cut from $345.96 to $262.66. And savings didn't stop with this reduction in purchase price. ARMCO Pipe was easy to handle and fewer joints meant less assembly work. Maintenance is sure to be less because there are fewer potential sources of costly joint leakage.

There is an even greater opportunity for economy on larger jobs. Why not learn how much *you* can save by using ARMCO Spiral Welded Pipe? Just send us your plans and specifications. The American Rolling Mill Co., Pipe Sales Division, 351 Curtis Street, Middletown, Ohio.

ARMCO

Armco

SPIRAL WELDED PIPE

ity of first laying down an inch or so of cork or other insulation to reduce heat transfer and amount of condensation.

If the old deck is no longer usable, it can be replaced with precast gypsum or cement slabs, or a metal deck insulated with cork slabs or some other material. These materials are all of moderate weight, easy to install, fire-resistant, and long-lived.

Now let's go inside and look around. Here the floors are likely to be the most important and troublesome element. They get more wear and tear and are subjected to more abuse than any other part of a building. Improper selection of floors in the first place, or changes in the character of the work done in different areas due to shifting of departments, may make things worse.

Examination by a competent inspector will determine the kind and extent of repairs needed, or whether it will be better economy to put down a new floor.

Need for strengthening floor girders to permit heavier loadings than were originally contemplated should also be kept in mind.

Fortunately there are a number of excellent types of floors and floor coverings to choose from, so that it is not difficult to find the right one for almost any condition.

Wood for Floors

Wood is one of the oldest flooring materials and still finds wide usage. A floor made of wood strips nailed to the sub floor is often used in factories or departments engaged in light manufacturing. It stands ordinary traffic and trucking well, is dustless, easy to keep clean, warm, and easy to walk or stand on. Maple or mixed hard woods (maple, beech and birch) are used where conditions require good resistance to wear, while pine or softer woods are satisfactory in areas where the duty is lighter.

Wood-block floors find wide application in areas where conditions are too severe for the type of floor just mentioned. They withstand blows and various forms of abuse,

You buy a hat to fit the need...

Now you can buy paint the same way—and you should!

MEET YOUR SPECIFIC NEED WITH ONE OF THESE 3 Outstanding Barreled Sunlight Industrial Whites!

YOU make every paint saving you're entitled to *only when the paint you use is matched to the job.*

That's why Barreled Sunlight now gives you *three* entirely different types of industrial white. Each one has been developed to cover specific areas quicker, better, more economically. All have the lasting *whiter* whiteness that only the secret Rice Process can produce.

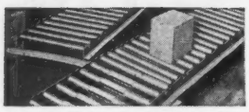
Before you paint or repaint, have your Barreled Sunlight Representative check every area in your plant. He'll show you exactly the paint you need to do the finest possible job at a lower "on-the-wall" cost. U. S. Gutta Percha Paint Co., 2-D Dudley St., Providence, R. I.

BARRELED SUNLIGHT

SPECIALISTS IN WHITE PAINT FOR INDUSTRY FOR 40 YEARS

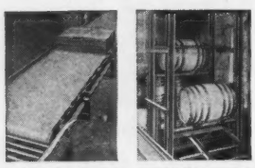
25% INCREASE IN OUTPUT!

- AND ANNUAL CASH SAVING OF $3000! . . .

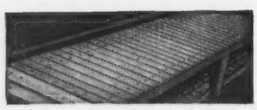


Gravity Conveyors—ideal where no power, except gravity itself, needed. See Catalog 35.

Live Rolls—permit stopping of package on power-operated roll conveyor. See catalog.



Belt Conveyors—used for medium duty power conveying. *Vertical Lifts*—lift and lower.



Apron Conveyors—for heavier duty power conveying. Inclined and horizontal applications.

Spiral Chutes and *Roller Spirals* provide "vertical" lowering by gravity. Many applications.

WRITE for copy of Case No. 10. The "high vitamin content" of this case history will surprise and stimulate you, start you thinking conveyor-wise, perhaps produce that handling idea you have been looking for. Report contains quotations made direct from user's own statement.

Send for Copy Today

Read this story about a Logan installation in a metal working plant. Case No. 10, and five other case histories recently prepared, will be mailed at once on request, no obligation.

LOGAN CO.
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510 Cabel, Louisville, Ky.

Logan Conveyors
PUT *FLOW* INTO PRODUCTION

and yet cannot be called fatiguing.

Concrete floors are used extensively because they offer the advantages of comparatively low cost and the ability to withstand really rough treatment.

Where the service is exceptionally severe, hard brick floors may be used. Iron plates are also used widely, either alone or to protect concrete or other kinds of floors at points such as trucking aisles or elevator entrances where the floor is subjected to unusual abuse.

Another type of floor that has found much favor is asphalt mastic monolithic or in the form of molded blocks. Floors of this material have a good deal of resiliency and stand up well under trucking and hard usage.

Finally, there is a considerable variety of floor coverings which are designed to be laid over an existing wood or concrete floor. Included among these are linoleum, cork carpet, asphalt tile, rubber tile and sheet, and fiberized mastic. Each possesses definite advantages for certain kinds of industrial plant service and conditions.

Lighting is one of the most noticeable features in any plant. Whether it is good or poor, you simply can't help noticing it. Employees notice it, too, and whether they know it or not lighting has a highly important influence on their productivity and morale. New plants are well lighted; many old ones are not. Hence the lighting alone may put an unmistakable date line on any plant.

Taking Light Readings

In checking up the adequacy of the lighting, the simplest procedure is to take foot-candle readings at all workplaces and in offices, storage areas, hallways and so on. These readings may be put down in the form of a table, or better still, entered on a floor plan. Comparison of the results of such a survey with the intensities which experience has shown to be desirable will give a fair conception of the adequacy of the present lighting system. Tables of the intensities recommended for different locations and various

"When I'm planning construction the Classified saves valuable time!"

These manufacturers list their local representatives in the classified (*yellow*) pages of telephone directories. For quick aid in plant-building, just turn to the proper classification, look for the trade mark or brand name of the product or service you want and there you will find the sales or service representative.

BELL SYSTEM

SOME CONSTUCTION PRODUCTS FOUND IN THE CLASSIFIED:

ACOUSTICAL MATERIALS
Johns-Manville Acoustical Materials

AIR CONDITIONING
Carrier Air Conditioning
Fitzgibbons Air Conditioning
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General Electric Air Conditioning
Holland Air Conditioning
Philco-York Air Conditioners
Trane Air Conditioning Equipment

AIR CONDITIONING CONTROLS
Friez of Baltimore
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Sherwin-Williams Paints

PARTITIONS
Johns-Manville Transite Walls

PIPE
Jones & Laughlin Steel Pipe

ROOFERS
Barber Genasco Roofers
Barrett Roofers
Bird Roofs
Johns-Manville Approved Built-up Roofers
Old American Asphalt & Roofings

ROOFING MATERIALS
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Johns-Manville Asbestos & Asphalt Roofing Products
Mule-Hide Roofing
Pabco Roofs & Shingles
Texaco Roofing Products

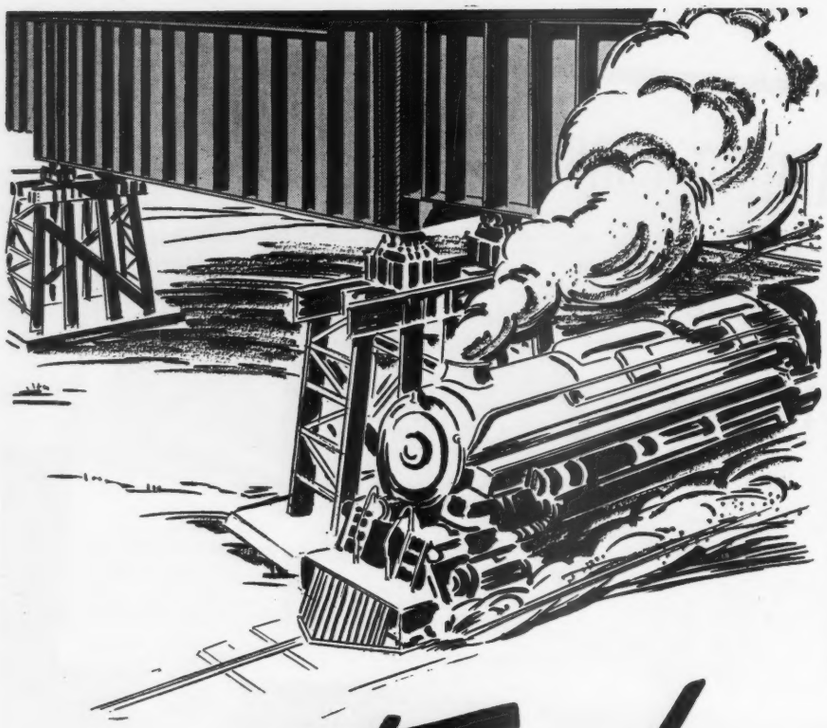
STEEL
Crucible Specialty Steels
Jones & Laughlin Cold Finished

STOKERS
Automatic Butler Coal Stokers
Delco-Heat Stokers
Electric Furnace-Man
Holland Automatic Coal Burners
Peerless Stokers

VENTILATING EQUIPMENT
Bar-Brook Comfort Cooling Equipment
Ilg Ventilating Equipment

WATER COOLERS
Frigidaire Water Coolers
General Electric Water Coolers

WEATHERSTRIPS
Accurate Metal Weather Strips
Chamberlin Metal Weatherstrips



HERE'S A *Tough* TEST OF PAINTS

TO the worst that the elements can do to protective coatings, add steam locomotive stack exhaust gases—hot and sulfurous. Paint that shows up as an unmatched economy in such service, will stand up under almost any adverse conditions. Records achieved by Dixon's Silica Graphite Paints have made their use standard practice on many important railroads. The same is true on exposed metal structures throughout the world—on great bridges, stacks, tanks, towers, and standpipes, exposed steel structures of all kinds . . . steel casements, stairways and doors, indoor structural members exposed to industrial fumes and moisture. Maximum protection and lowest painting cost per square foot per year are insured by proper application of these unique paints. The minute, flat flakes of natural graphite in pure boiled linseed oil produce a most tenacious, chemically inert, water-repellent armor against the attacks of weather, fumes, abrasion, and Time itself. Dixon's Silica Graphite Paints provide the basis of the most economical paint maintenance program ever devised. For long life at a saving, paint your structures with Dixon's Silica Graphite Paints. Fourteen colors and aluminum are available for your choice. Write for Master Specifications No. BI-44 as your guide to the ultimate in economical painting.

Paint Sales Division
JOSEPH DIXON CRUCIBLE CO.

Established 1827 D X N TRADE MARK **Jersey City, N. J.**

274

DIXON'S INDUSTRIAL SILICA-GRAPHITE PAINT

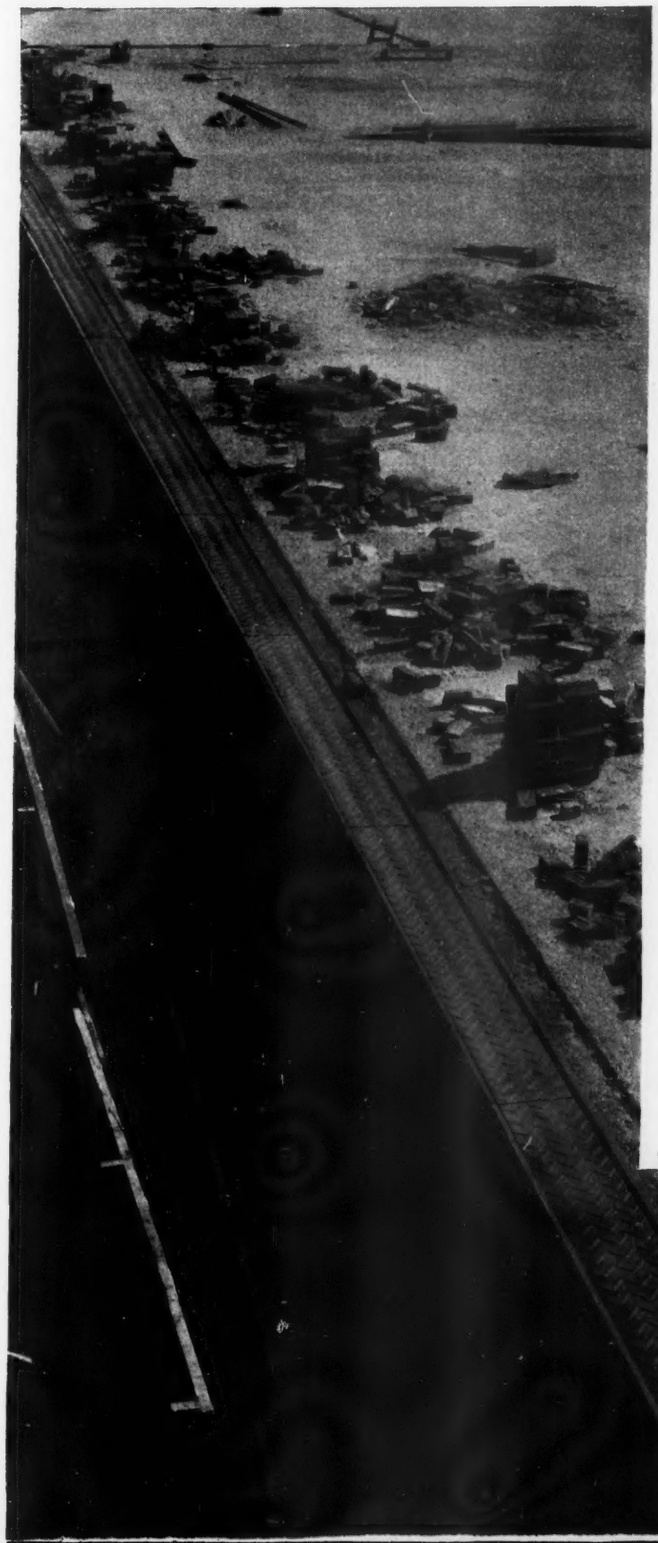
classes of work are readily available. These tables will serve as a guide, but more refined methods may be needed in determining the lighting required for specific operation. For example, with the visibility meter it is possible to determine within close limits the minimum amount of light required for any operation.

Laying out a suitable lighting system after the requirements have been established is not a difficult matter. One of the first steps is to find out whether the layout and capacity of the existing lighting circuits are fitted to the new requirements. It may be necessary and more economical in the long run to install a new system. If the system has been in use for any considerable number of years and has not been revamped, it will probably be found that mounting heights and spacing of fixtures are considerably different from recommended practice, and that the wire capacity is too low.

Fluorescent Lamps

During the past few years important improvements have been made in the efficiency of tungsten-filament lamps. Reflectors have been redesigned and improved in several respects. High-intensity mercury-vapor lamps either alone or in combination with tungsten-filament lamps offer important advantages and have come into wide use. Although they have been on the market for a comparatively short time, fluorescent lamps have achieved unusual popularity. Some new plants use these lamps almost exclusively, while a large number of others have sizable installations. Pleasing color of the light, an efficiency which is between three and four times that of filament lamps, and the small amount of heat dissipated, make fluorescent lamps worthy of careful investigation.

When the lighting system is being revamped, make sure that switching arrangements have the proper degree of flexibility. Burning of lamps that are not needed, in order to get light from a few others, is a sheer waste of money. Photocell control by which lamps are automatically



COCA-COLA PLANT
has Anaconda Through-Wall Flashing

Efficient . . . positive . . . adaptable ...durable and moderately priced

IN THE Coca-Cola Syrup Factory at Kearny, N. J., 7000 pounds of Anaconda Through-Wall Flashing* were used for the 12″ walls. This unique flashing has an integral dam throughout its entire length which gives thorough drainage in the desired direction. A series of zigzag corrugations of the same height as the dam prevents lateral movement in any direction.

Anaconda Through-Wall Flashing is easily locked endwise, simply by nesting one or two corrugations. Made of 16-ounce Anaconda Copper, these flashings are furnished in 5′ or 8′ lengths in a range of standard and special widths, and with various selvages.

Also available are one-piece inside and outside corner flashings, so designed that corrugations interlock with those of adjoining straight flashings, thus providing the same thorough flashing at the corners as on the wall.

Publication C-28 describes and illustrates Anaconda Through-Wall Flashing in detail.

•

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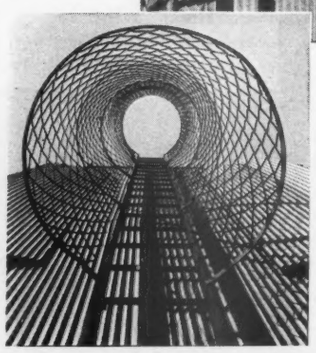
PUT SAFETY First WITH Steelcrete Expanded Metal LADDER GUARDS

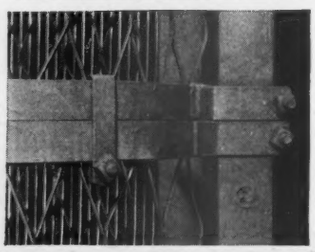
Great heights make many people dizzy, which accounts for the greater danger of falling from a ladder one hundred feet in the air than from only two feet above the ground.

The new Steelcrete Expanded Metal Ladder Guards minimize this tendency to become dizzy and reduce this hazard. Their very presence—surrounding the worker on all sides—gives him confidence and keeps him cool. Your Safety Engineer will confirm these facts.

Steelcrete Expanded Metal Ladder Guards are ready for erection and require no drilling for installation. They are one of many practical applications of Steelcrete Expanded Metal in modern factories. Write the nearest office listed below for complete details.



The Steelcrete Expanded Metal Ladder Guard completely surrounds the workman—gives him something to grasp, and helps to prevent any tendency to become dizzy.



The Steelcrete Expanded Metal Ladder Guard can be bolted quickly to any ladder. No drilling on the job!

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"IT'S WHEELING STEEL"

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turned on and off in order to maintain a desired level of illumination is an effective means of providing an adequate amount of light without waste.

Any study of the lighting system necessarily brings up the subject of painting, since the amount of light reflected from walls and ceilings greatly influences the effectiveness of the lighting system. And, of course, the color of their surroundings has an important psychological effect on employees. It is difficult for any one to feel happy day after day in a dingy, gloomy workplace.

When selecting interior paint, remember that glossy surfaces are likely to produce objectionable glare. Therefore flat or eggshell paints are usually preferred. Ceilings are commonly painted white, but a more pleasing effect can be obtained by using some light color, such as cream, ivory, or buff on the walls. In some plants aluminum paint is used extensively because of its permanence and comparatively high reflection value.

Good Places to Work In

One of the important differences between old and new plants commonly lies in the character and efficiency of the means employed to insure the well-being of employees and keep them comfortable.

Every plant must have some adequate means of heating workplaces to a comfortable, uniform temperature in cold weather. Dust and fumes must be removed, and provision made for supplying pure fresh air.

If the temperature of workplaces is either too high or too low, employees will feel uncomfortable and their efficiency, possibly health, will be affected. One of the early steps, then, is to establish the temperatures that are most suitable for the various areas. These will vary with the age and sex of the workers and the kind of operation performed. How to produce these temperatures and maintain them within close limits is the next problem.

Heating by direct radiation from pipe coils or cast-iron radiators was

(*Continued on page B103*)

(*Continued from page B82*)

formerly used in most plants. Size of the radiators and the virtual impossibility of securing a uniform temperature throughout the working area have caused this method of heating to lose much of its popularity. Radiators are still used in offices and other small rooms, also storage areas, but in almost all new plants unit heaters are employed in the working areas. They can be mounted on the floor or overhead, and can be had in a wide range of sizes and with characteristics to fit any requirement.

Unit heaters are economical to operate, provide uniform distribution of heat with circulation of the air, and are easy to control. They cannot, of course, make up for any deficiencies in the steam or hot water supply, and the piping. Therefore, each element must be carefully inspected and needed changes made.

Air conditioning is a necessity for the efficient and continuous conduct of a considerable number of processes. Close control of either temperature, humidity, or both is important or necessary in a still larger number of cases. Aside from these instances where such control of atmospheric conditions is required for efficiency of operation, some plants have installed air-conditioning systems solely in the interest of employees' comfort and efficiency.

Minimizing Heat Loss

Regardless of the purpose for which air-conditioning equipment is installed, both the original cost and the cost of operation can be reduced by proper insulation of the area. The problem is to cut down as much as possible the transfer of heat between the interior and exterior of a refrigerated or heated space. Low heat transmission not only minimizes heat loss or gain, but it also cuts down condensation, which is troublesome and leads to rapid deterioration of the surfaces on which it collects.

A number of good insulating materials are available. By using a sufficient thickness of insulation heat transfer can be practically eliminated, but there is an economic bal-

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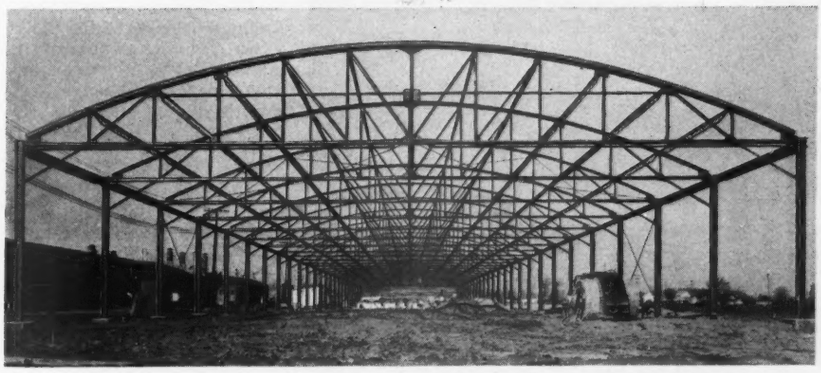

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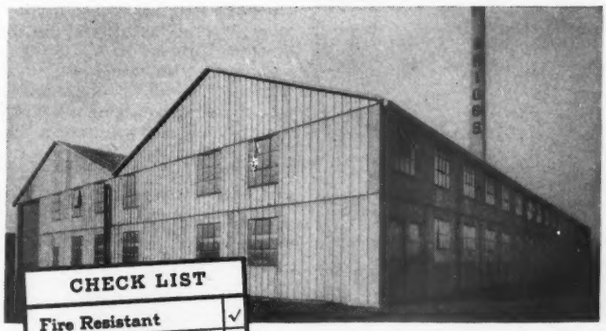

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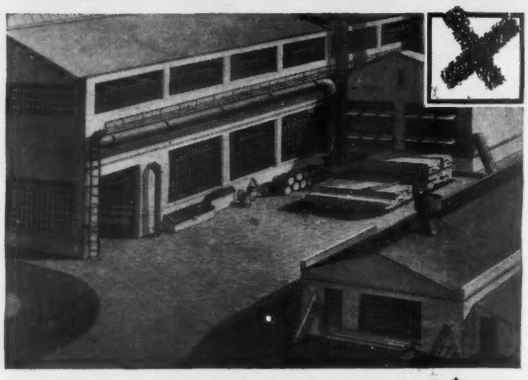
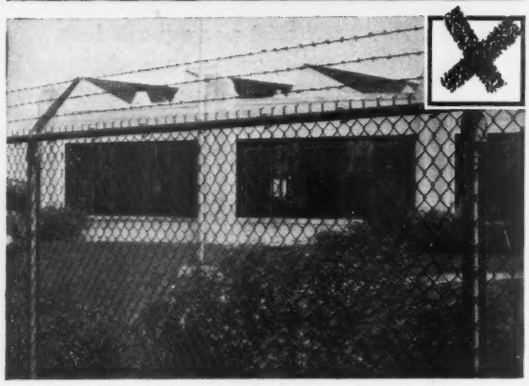


Easy!

Is your plant an easy mark, with little or no protection against burglars, marauders or firebugs? Do you really think a watchman can properly guard all parts of your plant? Isn't that leaving a lot to a man who can't possibly be everywhere at once?

Maybe!

Or does your plant protection depend on flimsy patched-up fence that commands the respect of no one? Passers-by, thieves, or your own workers—all can note the disregard for property which this represents. Easily torn apart, it affords little protection.



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UNITED STATES STEEL

ance between the cost of heat or refrigeration and the cost of insulation, which limits the economical thickness of the latter. As a general rule, two or three inches of good insulation is sufficient and does not entail excessive cost.

Heavy condensation on the windows of air-conditioned areas, particularly where high humidity must be maintained, often presents a problem. Preventive measures usually involve the use of double glazing in the same frame, sealed double glass, or double sash. In some installations, provision is made for heating the air between the glass sheets by the use of small steam coils or electric heaters, and thus prevent condensation by keeping the air warm and dry.

In Place of Windows

Glass blocks are also frequently used in place of windows. They admit a considerable amount of light and have about the same heat insulating value as double sash. Another advantage lies in their lack of need for painting or maintenance.

Sanitary facilities are now receiving much more attention than was formerly paid to them. In some instances, state and local regulations have helped to focus attention on them, but a more potent influence has been the growing recognition on the part of management that bright, clean washrooms, conveniently located supplies of cool drinking water, good shower baths, and sanitary lockers for clothing have a decidedly beneficial effect on employees' morale and loyalty.

It is also being well recognized that mere provision of adequate facilities somewhere in the plant is not enough; toilets and washrooms must be located convenient to workplaces in order to cut down to a minimum the time spent in walking to and from them. To eliminate interference with manufacturing operations and avoid the loss of valuable floor space, it is becoming common practice to locate toilets and washrooms on mezzanine floors. In some plants they are located on platforms suspended from the roof.

Manufacturers have done their

Basically different Principle means...

LESS WEAR
LESS MAINTENANCE
LONGER LIFE

The Westinghouse Hermetically-sealed Unit

...the HEART of every "TEMPERED COLD" WATER COOLER

...reduces maintenance costs by eliminating (1) Belts (2) Pulleys (3) Gaskets (4) Shaft Seals (5) Commutator Brushes.

Fewer parts to wear. Even these parts operate in a permanent supply of oil. No oiling necessary. Built-in Watchman prevents costly motor burnouts. All this means EXTRA years of trouble-free performance.

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...with the PERMANENT COST CONTROL PLAN

Modernize your drinking water system and save money at the same time with this Westinghouse 3-point plan:

1. Standard one-year free replacement warranty on unit and cabinet.
2. During the next four years, if the Hermetically-sealed Unit should fail, Westinghouse replaces it without charge—and pays all transportation and labor costs.
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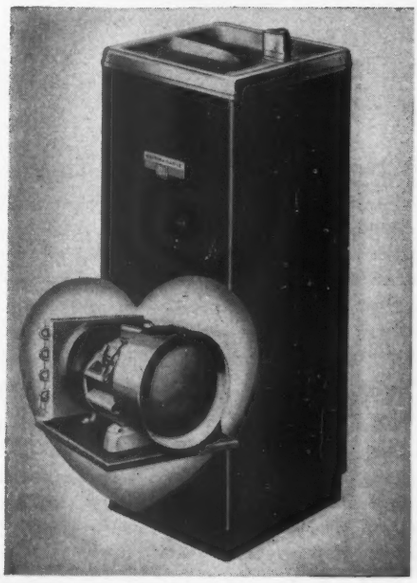

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Non-Clog Drain • Stainless Steel Top • Special Capacity Booster • High Efficiency Cooling Chamber • Built-in Watchman • Hermetically-sealed Unit.

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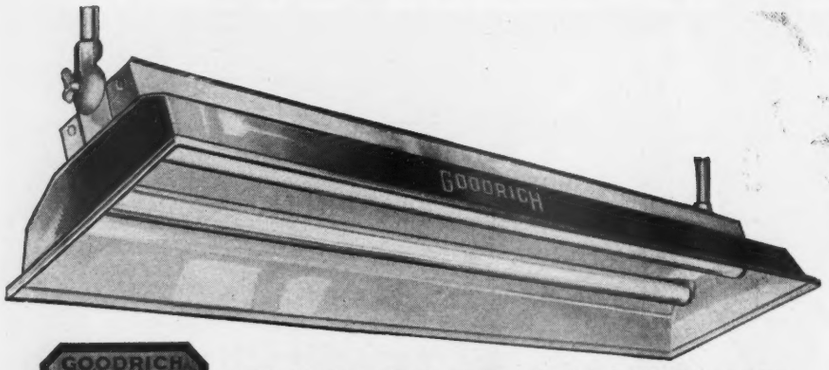

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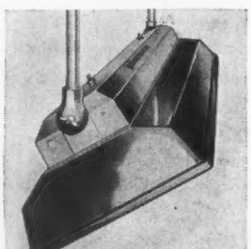
FLUORESCENT FIXTURE FOR INDUSTRIAL USE

It's new—designed for use with two 48-inch fluorescent lamps, for general and local illumination of industrial areas.

Its design, with closed ends, gives you proper shielding of lamps for better control of light. Its porcelain enamel finish assures proper diffusion of light for illuminating both horizontal and vertical surfaces—without reflected glare. Ballast equipment corrects for power factor and flicker. The fixture is also equipped with replaceable starters.

This Hinge Makes It Easy to Wire, Install and Service

Hood and reflector come apart so that wiring of reflector may be done on the bench, instead of overhead. After suspending the hood, reflector is attached by two open hinges and allowed to hang downward while line connection is made. Hood and reflector are then securely locked together with knurled thumb screws. This unique construction also provides free access for servicing.



Supplied with Adjustable Bracket for Chain or Conduit Mounting

For correct direction and distribution of light on any working plane, the reflector may be set at any desired angle by means of an adjustable bracket, furnished as standard for both chain and conduit mountings! Write for catalog sheets.

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part, too, in helping to improve sanitary facilities by developing fixtures of all kinds in a wide range of styles and prices. Good-looking equipment designed for long service can be obtained at prices which any plant can afford to pay. If highly attractive and expensive fixtures are wanted, they too can be had.

Type and quality of fixtures required for a plant depend largely on the grade of the employees.

Building features alone are not the only element which stamp a plant as modern or old-fashioned. Some of the services to production can date a plant almost as quickly as anything else can. For example, mechanical power transmission.

It isn't so many years ago that practically every piece of equipment was driven from a lineshaft. One or more engines furnished all power; therefore, lineshafts had to be long in order to reach all the machines. Changes in speed often required cumbersome and bulky arrangements of belts and pulleys, or noisy open gearing. That picture has been completely changed.

Better Methods

Close study of the problem of transmitting power from prime mover to machine under the conditions imposed by modern production equipment has given rise to new and better methods made possible by new and more efficient equipment.

Excessively long lineshafts are outmoded, and along with them have gone high friction losses, trouble, and waste of power. Now the length of shafts and the number of machines driven in one group are set within the limits which have been found to be most suitable and economical.

Experience has shown that under several different conditions it is necessary or advisable to have machines driven by their own motors. Advantages and limitations of both methods of driving machines have been well established, along with reliable general principles that can be followed in determining which method is better suited.

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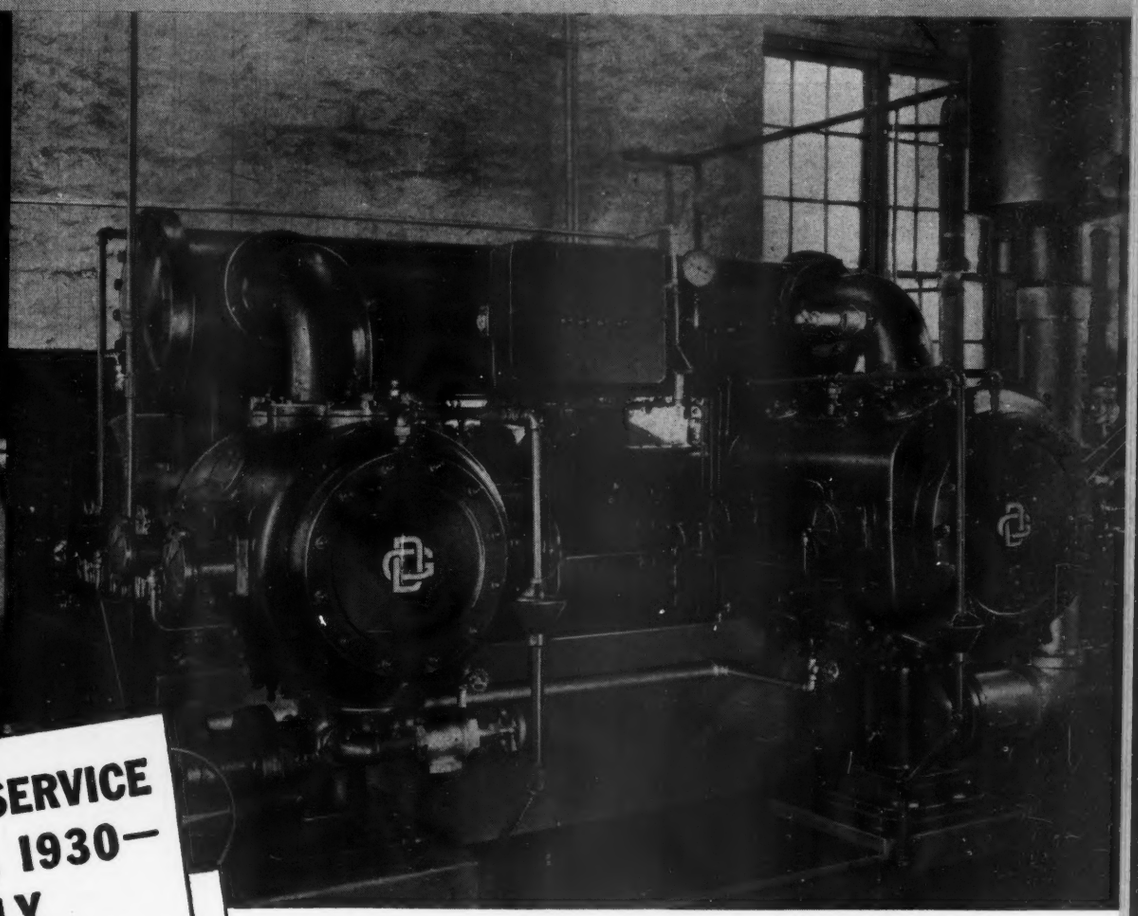
BLUE RIBBON PERFORMANCE

WITH GARDNER-DENVER "HA" AIR COMPRESSORS



16 HOURS A DAY SERVICE SINCE JUNE 18, 1930— WITH ONLY TWO MINOR REPAIRS!

Here's a typical performance record for Gardner-Denver "HA" Horizontal Two-Stage Compressors—

In a large southern plant, a Gardner-Denver "HA" 15 & 9x10 compressor has been working 16 hours a day—every working day—since June 18, 1930. A total of 88 hours for every 5½-day week since this machine was installed. The machine furnishes air for cleaning throughout the mill, and the air pressure is 100 lbs.

The master mechanic of the plant advises that after 9½ years of service, the machine has required only two minor repairs at a nominal cost. The owner states that the Gardner-Denver "HA" compressor has operated more efficiently than any other air compressor they have had.

LOOK at them from any standpoint—high volumetric efficiency—low operating cost—long life—and you'll find Gardner-Denver "HA" Horizontal Two-Stage Air Compressors getting "first award" in plants throughout the country. Gardner-Denver superior design—Gardner-Denver special features such as cushioned Duoplate valves—economy advantages such as the five-step capacity control—Timken tapered roller main bearings—are some of the reasons why these compressors are first choice in so many plants today. For more dependable, more economical air in *your* plant, you should have full information about Gardner-Denver "HA" Horizontal Two-Stage Air Compressors. Write us for the complete facts! Gardner-Denver Company, Quincy, Illinois.

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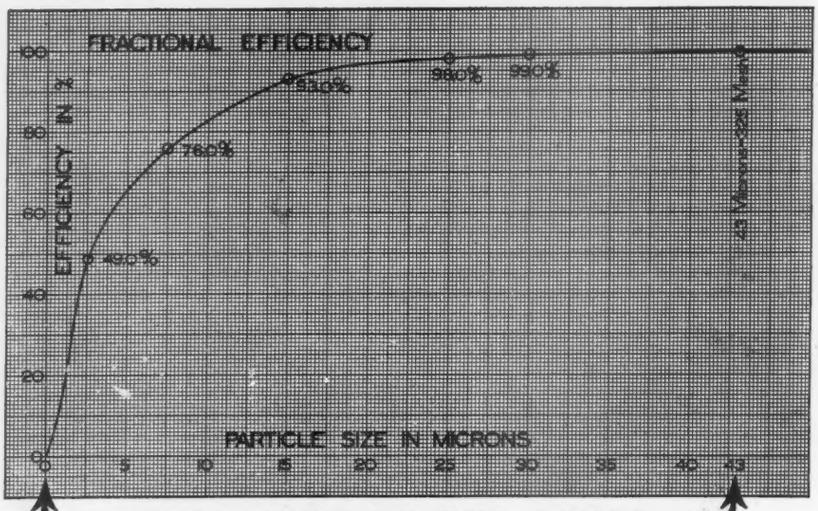

THIS PART OF THE CURVE DETERMINES OVERALL EFFICIENCY

It's the dust *smaller* than 44 microns—dust that passes through the finest commercial screens—that is hard to collect. Yet "overall efficiency" (a much abused term) cannot be determined until the exact percentage of collection for each particle size between 0 and 43 microns is known.

Buell bases its guarantees for dust collection and fly ash correction on FRACTIONAL EFFICIENCIES. Buell guarantees the exact percentage of each dust particle size that will be collected, and *these guarantees hold regardless of changes in particle size frequency* that affect overall efficiency.

The Van Tongeren System used exclusively in Buell equipment offers outstanding advantages in efficiency, low first cost and guaranteed performance. Investigate Buell and save money.

Only Buell Cyclones have a Dust Pocket

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"Fractional vs. Overall Efficiency Guarantees" is an 8-page bulletin explaining the importance of particle size analysis in determining dust collection guarantees. A copy is yours for the asking.

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energy throughout the manufacturing departments has also undergone changes that make for greater economy and efficiency. For example, it is now possible to make a plant distribution system much more flexible than formerly in accommodating changes in load or shifts in the location of machines.

In every plant several circumstances combine to make frequent and oftentimes radical changes in layout necessary. To minimize the cost of running new conduit lines when such changes are made, several so-called flexible distribution systems have been developed. They consist of busbars or cables carried in metal ducts with provisions for plugging in or tapping off at any desired point.

They are easy to put up and can quickly be taken down and installed in some other location whenever necessary.

To Eliminate Costly Delays

Tempo of modern production methods makes delays in transmitting orders or securing information too costly to be tolerated. Many written records must be kept, of course, but effective direction and control of production require means by which all executives and departments can easily and quickly communicate with each other. This need has been met by the development of private telephone systems and paging devices. They range all the way from inexpensive outfits limited to a few stations to dial-operated systems serving many stations as desired. Within the past few years loudspeaker telephones and public address systems have come into prominence. Both possess advantages that are well worth looking into.

It's no disgrace for a plant to be old in years. As the foregoing pages show, a great deal can be done to make an old plant belie its years, and there is no good reason why it cannot have practically all the aids to low-cost production and employee comfort and conveniences that the most modern plant possesses. No amount of face-lifting and revamping, however, can dispel the im-

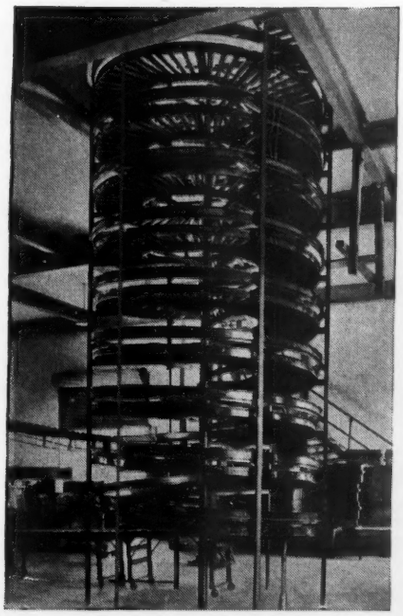
Why YOU CAN PROFIT BY *Standard's* EXPERIENCE . . . ON YOUR NEXT CONVEYOR INSTALLATION

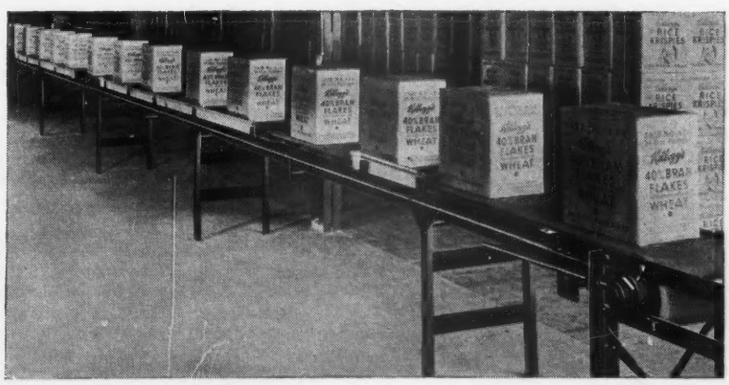
On any kind and size of conveying job—large or small—get full facts on equipment from a Standard Conveyor Engineer—first! Their expert counsel, reflecting more than thirty years of conveyor engineering experience, can save you time and money in choosing the right kind of an installation to hold handling costs to a minimum.

Find out why Standard Conveyors offer you more than lower handling costs—because of their sound engineering—durable construction that means many years of profitable performance in your plant.

There is a Standard office near you—get in touch with them on your next conveyor requirement.

17 Different Types of Conveying Equipment—Including Gravity and Power—Are Available in Standard's Line





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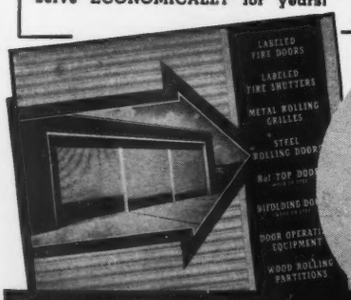
Put Kinnear Money-Saving Doors In Your Plant!

It's easy to see **why** the coiling, upward action of Kinnear Rolling Doors saves you money. Kinnear's rugged all-steel curtain of strong, interlocking slats can't warp, sag, split, or pull out of shape. It defies weather, repels fire, prevents intrusion, and resists wear! The doors operate quickly, smoothly and easily all year long, because they open **over** snow, ice and swollen ground. They require no usable space, and they open out of reach of damage by wind or vehicles. You get all these advantages — and more — with Kinnear Rolling Doors. It will pay you to know more about the economies these doors afford . . . to learn why so many industrial firms are specifying Kinnear Rolling Doors. Write for the complete new Kinnear Catalog.

KINNEAR MOTOR OPERATION ADDS EXTRA EFFICIENCY

The time-saving convenience of electric push-button control can easily be added to any Kinnear Rolling Door. With motor control, doors can be opened quickly from any number of convenient points. The heavy-duty Kinnear Motor Operator is built to serve ECONOMICALLY for years!



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Kinnear also makes STEEL ROLLING FIRE DOORS—approved by Underwriters' Laboratories—for safe, automatic fire protection . . . STEEL ROLLING GRILLES for positive, convenient protection without sacrifice of light, air or vision . . . WOOD and ALL-STEEL RoL-TOP DOORS, rugged sectional-type upward-acting doors with provision for any number of light sections. Full details in the Kinnear catalog!

KINNEAR ROLLING DOORS

pression created by poorly kept grounds. How much landscaping is desirable and how much money can be allotted for it are matters which the management of each plant must decide. It's certain, however, that well-kept, properly fenced grounds are an asset whose value no plant can afford to overlook.

Trends in Building Design

(*Continued from page B39*)

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the advantage of facilitating even distribution of natural light, and can be clear or wired, except where obscure glass is desired to shut off the view of one department from another. Glass block also serves as an excellent material for partition construction where the latter conditions prevail, especially since dead-air space in the block facilitates insulation.

Conveyor systems have become such an essential element in the efficient functioning of mass-production industries that they exert a definite influence on the initial design of many plants. This is particularly true where overhead conveyors can be profitably employed.

Space Savers

In some plants one finds intercommunicating monorail systems which literally give access to every square foot in areas extending over several acres. While such installations are the exception, comparable advantages are obtained in many plants by the careful planning of transfer cranes and the installation of hand or power hoists on the lower flange of regular roof members which can be readily employed for monorails to serve the areas between craneways.

The bulk-handling industries have been the first to recognize the opportunities for operating industrial cars or other conveyors through roof trusses, from which diagonal web members have been eliminated. Such trusses, which convert otherwise useless roof areas to a profitable function, could be

WESTINGHOUSE FLUORESCENT LUMINAIRES in G. M. Factory

Described as an outstanding example of modern industrial construction, the new General Motors' Allison Plant at Indianapolis is illuminated by Westinghouse with the first large scale application of Fluorescent Luminaires. The lighting layout—carefully planned by engineers and lighting experts from General Motors and Westinghouse—is designed to simulate midday north daylight 24 hours of the day, since no windows are available in the factory proper.

All of the Westinghouse Type FA Fluorescent Luminaires installed contain three 48-inch, 40-watt Daylight Fluorescent lamps. Each lamp and its auxiliary has a power factor of 90-92% with an Alzak processed reflector.

Westinghouse Fluorescent Units create 24 hours of daylight in new, windowless aircraft engine plant of the Allison Division, General Motors Corp.

Actual benefits reported in this installation include:

The glareless quality of these Westinghouse Fluorescent Luminaires is not only more beneficial to workmen's eyes, but is also a distinct aid in production. These new units not only give more light than ordinary bulbs, but give off only one-third as much heat, for one of the tubes may be held in the hand without discomfort. This type of lighting was chosen because of its efficiency and aid to employes' comfort.

. . .

There is a Westinghouse Fluorescent Luminaire for every industrial lighting application. Complete information from your nearest Westinghouse Distributor or Sales Office, or write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, O.

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New POWER-FLOW
ROOF VENTILATOR
for positive ventilation at all times

SAVE WEIGHT AND SPACE with AXIAL FLOW PRESSURE FANS

Replaces centrifugal blowers, resulting in reduction in cost, space, weight and horse power. Sizes from 18" to 12'.

CUT FUME REMOVAL COST WITH BIFURCATORS

Installs right in the duct. Eliminates special supports, expensive platforms and direction change. Non-overloading power characteristics. Motor isolated from fumes. Lighter in weight . . . more economical.

PERFORMANCE NOT AFFECTED BY TEMPERATURE OR WIND DIRECTION

MORE AIR PER HORSEPOWER — operates at low tip speeds. Assures quiet operation. Guaranteed performance ratings.

EFFICIENT AGAINST PRESSURE — Uniform velocity of air over entire working face of fan accomplished by accurately maintained blade profile and pitch angles.

ELIMINATES BURNED OUT MOTORS — Non-overloading power characteristics protect motors. Power required remains constant over entire range of operation from free delivery to shut-off.

NO ENTRANCE EDDY LOSSES — New "Log Cone" Entrance Ring assures free entrance of air to fan blades for expulsion. More efficient.

WIDE RANGE OF SIZES AND CAPACITIES — DeBothezat Power-Flow Roof Ventilators are available in a wide range of sizes and motor speeds and are furnished for any standard electric current. Get complete details on this new Roof Ventilator. Simply fill in the convenient coupon below.

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utilized in many industries to carry parts from foundries, press shops, paint shops, or other special departments to assembly lines over conveyors that would not utilize valuable floor space or obstruct the clearance overhead.

Warehousing problems have been greatly simplified by modern methods of racking and sorting which make it possible to store larger quantities of materials or merchandise in a given floor area and provide a visible inventory that can be checked at any time. To gain these advantages, however, one has to have clearances that insure free flow of traffic and ready access to the stock, ample floor height for stacking, plus floors capable of carrying the load and standing up under constant operation of motorized lift trucks, if these are required. Certain industries are beginning to find that by efficient mechanical handling and planning it is cheaper to store bulk materials inside under cover than out-of-doors, where they have been subject in the past to deterioration, corrosion, and shrinkage.

Putting Gravity to Work

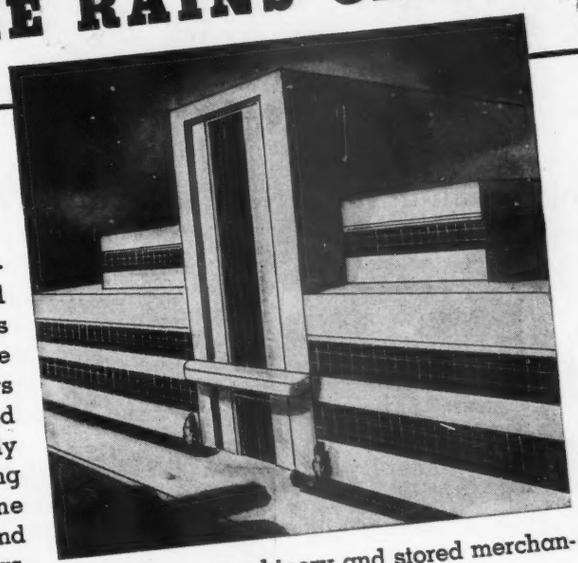
In multi-story plants, where gravity flow usually plays an important part in the handling of materials, the conveyor systems are frequently the most important factor in the design. This is particularly true in the chemical industries and in many branches of the food industry, which is so closely allied to chemicals. Structural welding has facilitated the solution of complex problems created by bulky equipment required in such plants, since it must be accessible from all points, although individual items of equipment may weigh several hundred tons and may be several or many stories high.

Industrial air-conditioning installations are still limited, for the most part, to industries where the process derives fundamental advantages from such controls, or where complete control of conditions is engineered, as in windowless plants. Controlled ventilation, however, is rapidly gaining general acceptance

NOAH *was ready* WHEN THE RAINS CAME

WILL YOU BE?

Noah had his substantially built ark ready and waiting when the rains came. Sometimes we wonder whether present day owners of industrial plants are as far-sighted as Noah. All too frequently unusually heavy rains accompanied by strong wind, have caused water to come through unprotected concrete and masonry walls of industrial buildings, resulting in literally millions of dollars of damage to machinery and stored merchandise. This is particularly true in basements and warehouses.



Water waste can be eliminated. Maintenance engineers can be as far-sighted as Noah. New and existing buildings can be made waterproof. Take the precaution of specifying that all concrete and mortar used in industrial buildings be made with Medusa Waterproofing, using first class workmanship. Medusa Waterproofing lines the pores of the concrete or mortar with a waterproofing material that repels all water at the surface. The cost of using Medusa Waterproofed Gray Portland Cement or Medusa Concentrated Waterproofing Paste or Powder is only a small fraction over the cost of unwaterproofed materials. Don't be caught by unexpected heavy storms. Protect your buildings now. Send coupon below for copy of book, "How To Make Good Waterproofed Concrete" which gives complete information on waterproofing new and existing buildings.

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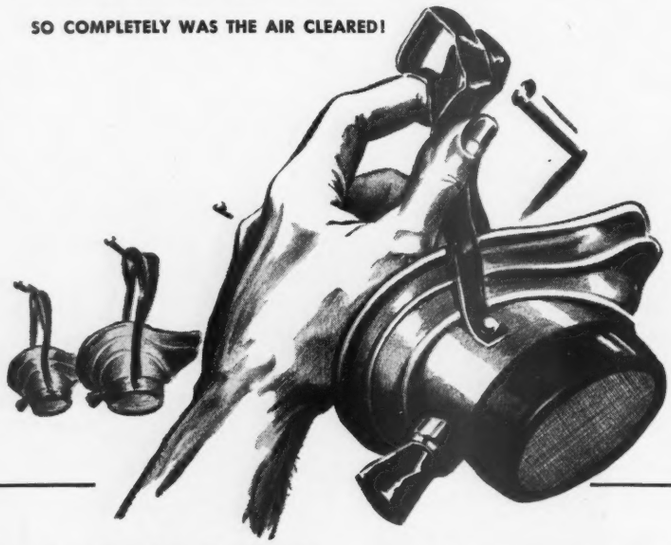
Medusa Products also made in Canada by Medusa Products Co. of Canada, Ltd., Paris, Ontario

They hung up their dust masks...

SO COMPLETELY WAS THE AIR CLEARED!



Ending this health hazard paid in more ways than one!

Emery dust. Fine steel particles. What a hazard to health - they were in the Swing Grinder room of a well-known eastern manufacturer! Workers had to wear dust masks at all times to avoid the ever-present threat of deadly Silicosis. Results:—production slowed down and labor turn-over boosted.

Then a Sturtevant Dust Removal System was installed. Out went emery dust and steel particles . . . sucked away at the grinding wheels *before* they could get into the air. And off came the workers' dust masks . . . so completely was the air cleared! Production went up . . . labor turn-over down.

This case history is typical of those reported, throughout industry, by users of dust and fume removal systems engineered by Sturtevant to exactly meet individual conditions. If you are confronted with a dust or fume problem, we are confident it will pay you to discuss it with a Sturtevant Engineer located in our nearest office. Let us put our over 75 years of air engineering experience at your service.

Typical Sturtevant Dust Removal System in Swing Grinder room. Lighter dust is drawn into headers located at each grinding wheel and exhausted to a centrifugal cyclone collector. The heavier particles of emery and steel are trapped in a steel box located under each wheel.

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Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work

AND OUT GO DUST AND FUMES!

as an essential to efficient operations. Air filters are being used at air intakes, with thermostatically controlled unit heaters, which are sometimes equipped for cooling.

Roof ventilators of various types have been perfected to facilitate the exhausting of used air and to maintain good circulation. In printing plants, where elimination of dust from overhead is particularly important, for instance, we find monitors completely inclosed by glass block, and ventilators that obviate the necessity for monitor sash.

While it would be difficult to establish the relative importance of sawtooth, monitor, and flat roof construction in industry today, each has its definite advantages and is more flexible than ever before. This is largely accounted for by the availability of the new ventilators, revolutionary lighting equipment, and by the newer structural forms that permit the maintenance of maximum clearances in the plant.

What Roofing Materials?

Roofs themselves employ a variety of relatively new materials, and are designed for insulation and sound absorption where these are advantageous. Cement - tile and metal roof decks are found in increasing numbers, the latter frequently being welded. Cork, fiber glass, gypsum, and other fibrous and mineral products are used for insulation. Where acoustical properties are incorporated in the roof structure, the deck itself is generally of steel.

The spent cold water from air-conditioning systems or from certain clean processing operations is frequently sprayed on roofs to facilitate comfort cooling of plant areas.

The interest shown in windowless construction has opened up an entirely new line of thought among production executives. Plants of this type already in service indicate pretty clearly that windows in the sidewalls of a plant definitely limit the percentage of useful space. This was never fully appreciated until the idea of a controlled-conditions plant actually had been applied.

Here the problems disappear of

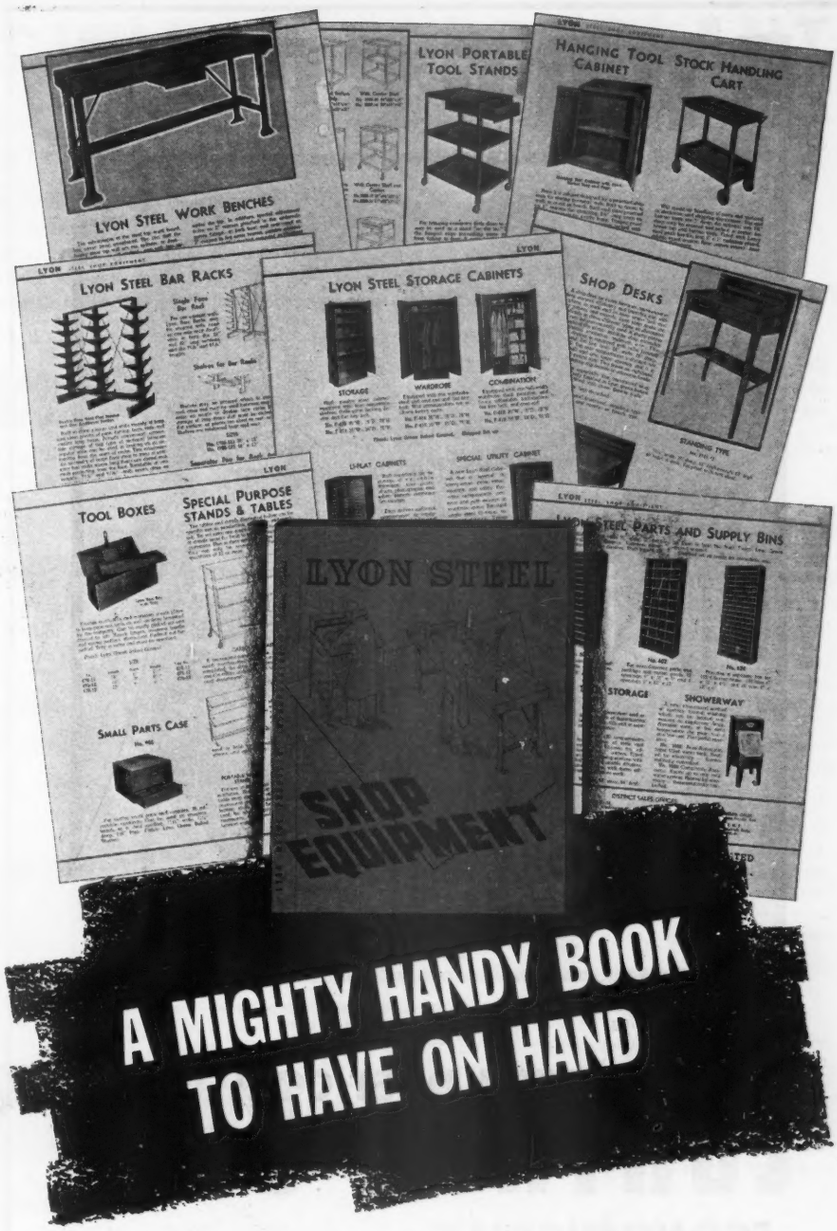
laying out equipment so that light entering through sidewalls will fall upon the work in just the right way, without subjecting the worker to discomforting extremes or contrasts. You have just the type of light you need and exactly where you want it. You do not have to stop to consider whether equipment that logically belongs along the outer wall might be casting shadows around the plant or shutting off much-needed light at other locations farther in. There are no such things as "chosen" floor space or "good" and "bad" machine locations, which are so often a source of difficulty for men and foremen.

Daylight Always Desirable

On the other hand, daylight from above—when you can get it—is just as desirable as ever. It is entirely possible, therefore, that some controlled-conditions plants of tomorrow may have windowless walls and sawtooth or monitor roofs admitting light through glass block or double-glazed fixed sash, with fluorescent lighting automatically controlled by rheostats and photo-electric cells to make up for any deficiency in daylight.

The planning of production lines in such a way as to eliminate all waste motion is paralled in the modern plant by the arrangement of lavatories and locker rooms where they are readily accessible from all points. Frequently situated on mezzanines built right into the monitors, where these have been provided, lockers and wash fountains in one large plant just completed for the aviation industry are set right on the production floor, with toilets and additional wash fountains on the mezzanine just above them and supported on the locker framing itself.

Separate locker and service buildings, built with insulated steel and available in standard sash and wall panels, have been found to offer the ideal solution to problems encountered in steel plants and similar industries. Wherever these facilities are housed, special attention must be given to ventilation. Illumination must be adequate to insure cleanliness, which is best maintained



A MIGHTY HANDY BOOK TO HAVE ON HAND

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Lyon shop equipment has proved its efficiency and economy in the plants of leading industrial organizations for nearly forty years. Quantity production makes possible very moderate prices for equipment that is outstanding in quality . . . and that offers many distinctive features that contribute to production efficiency, protection of materials and tools, and space economy. Mail coupon for catalog, and ask your mill supply salesman for full details about the service he can give you on any item you need. LYON METAL PRODUCTS, INCORPORATED, Aurora, Illinois.

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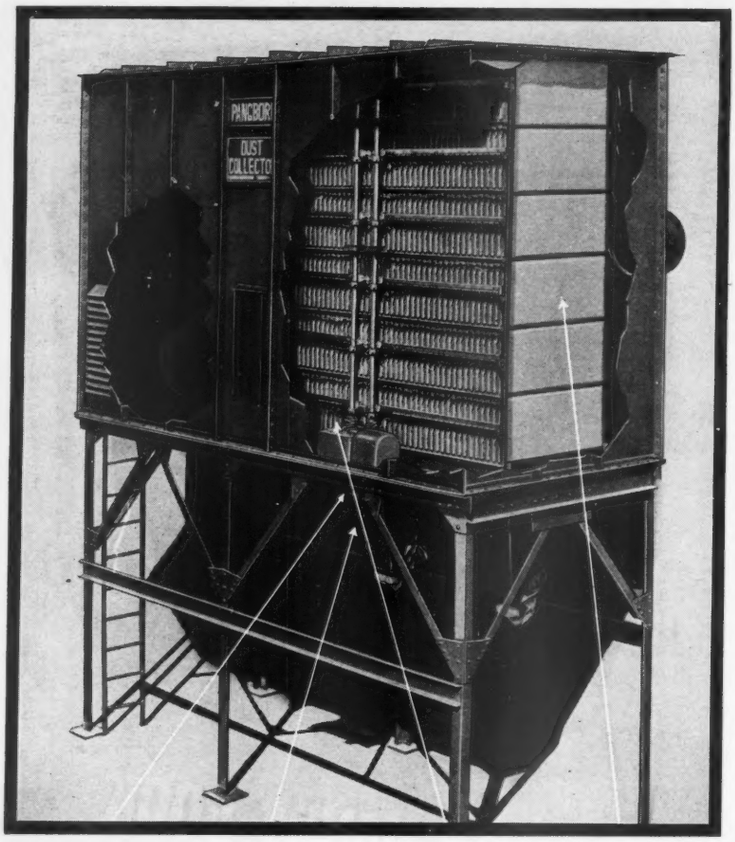

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CLOTH SCREEN DUST COLLECTORS
CONTROL DUST

ECONOMICALLY Dust control pays a dollars-and-cents profit! Collected materials may be re-used—or sold. Sizes and types of Pangborn Dust Collectors for every need. Pangborn Engineers, with a background of thirty-three years' experience, are well qualified to serve you expertly.

SAFELY Dust *under control at its source* can do no harm. And more than four thousand, five hundred Pangborn Steel Frame, Cloth Screen Collectors are in daily operation in all parts of the world—proving to well-satisfied users that *controlled dust* saves property and assures safety from the damaging destructiveness of dust.

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if glazed tile, porcelain enamel, or other vitreous wall materials, and tile or finished concrete floors, are provided.

Safety features are engineered right into the modern plant. Electrical outlets and switchboards are equipped, for the most part, with foolproof connections and special protection against overloading. Production equipment is painted with a view to accident prevention, bright colors being used to identify machinery with moving parts exposed. Floor construction is designed for safety and employee comfort, with checkered floor plates, wood, and wood block, as well as specially surfaced concrete, being widely used. The type of flooring is dictated by production operations in the area served, so that it is not unusual to find several kinds in a single department. Where concrete is required to meet the general demands, rubber floor mats are frequently laid alongside assembly benches to minimize personal fatigue.

Special walkways overhead in some plants facilitate general supervisory observations and detection of unseen safety hazards. These walkways, and windows overlooking large plant areas, have been provided primarily to enable outsiders to witness production operations without interfering in any way with the normal plant operations. The tendency to provide such facilities has been increasing, particularly in consumer industries, in line with enlightened public relations programs, but they are no less important in any business with a large number of customers.

Encouraging Visitors

Special facilities for display, demonstration, and testing of products are being provided in increasing numbers at manufacturing plants, where they supply an additional incentive to visits by the customer. Such contacts are further encouraged by the presence of research facilities well organized and appropriately housed. Laboratories of this sort, rendering extensive service to customers in the solution of production and development problems,

"HEAT-CONDITION" YOUR PLANT *with* ROCKBESTOS *heat-resisting wires*

Here's real help for you in condensed form. Clip out and keep this page for quick reference when you reach the wire-specifying stage of your planning. If any of the wiring in your plant is exposed to heat, oil, grease, corrosive fumes or fire hazard—then you need Rockbestos. We show but a few of our wide line of asbestos insulated wires and cables. Samples and our red-covered No. 10-E Catalog on request. Read the descriptions and learn how our wires may help you.

Rockbestos Products Corporation, 953 Nicoll Street, New Haven, Connecticut

INDUSTRIAL HEATING CABLE—TABLE LH

No. 19 A.W.G. nickel-chromium wire insulated with .040" of felted asbestos and covered with 4/64" waterproof lead sheath.

This pliable cable distributes a mild heat evenly over large areas. Prevents freezing of water pipes, wet pipe sprinkler systems, etc. Keeps conveyor pipes for soap, varnish, ink, chocolate, etc., at temperatures that insure even flow. Send for folder.

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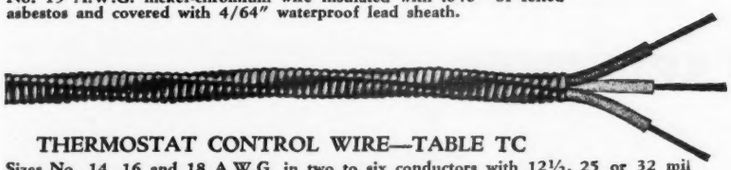

THERMOSTAT CONTROL WIRE—TABLE TC

Sizes No. 14, 16 and 18 A.W.G. in two to six conductors with 12½, 25 or 32 mil wall of felted asbestos insulation and cadmium plated steel armor.

A multi-conductor control wire for low voltage intercommunicating, signal and temperature control systems. Its lifetime insulation and metal braid armor will give you troubleproof circuits.

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600 VOLT A.V.C. BOILER ROOM WIRE—TABLE C

Sizes No. 18 to No. 0000 A.W.G. This construction for sizes 18 to 8, sizes 6 to 0000 have another felted wall next to the conductor.

For lighting and control circuits exposed to heat and moisture, oil, grease, fumes or fire hazard, such as exist around furnaces, ovens, lehrs, soaking pits, boilers, etc., this widely-used A.V.C. construction is ideal. Also for locomotive panel wiring and for switchboards on which an asbestos braided wire is required.

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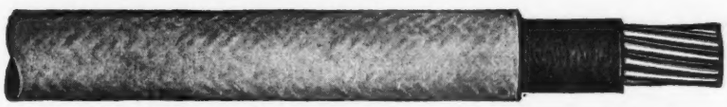

600 VOLT ALL-ASBESTOS RHEOSTAT CABLE—TABLE R

Sizes No. 18 A.W.G. to 2,500,000 CM insulated with a heavy wall of felted asbestos and a rugged asbestos braid. Finished in black, white or colors.

Use this power and rheostat cable or Table A, All-Asbestos Rheostat Wire for wiring rheostats, switchboards, elevator and locomotive control panels and electrical equipment exposed to heat, fumes or fire hazard. Also for general open wiring in hot locations.

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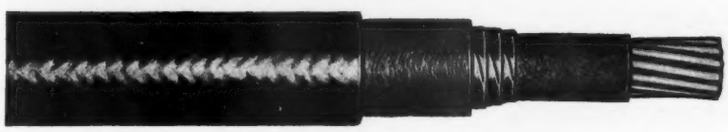

600 VOLT A.V.C. POWER CABLE—TABLE E

Sizes No. 18 A.W.G. to 2,500,000 CM insulated with laminated felted asbestos and varnished cambric, and asbestos braid. Other constructions for service voltages up to 8000.

This cable is recommended for power circuits and hot-spot wiring in or around boiler rooms, ash pits, steam tunnels, soaking pits, tenter frames, glass plants, steel mills, etc. The asbestos and heat-sealed varnished cambric construction has ample moisture resistance and withstands high temperatures indefinitely without failure.

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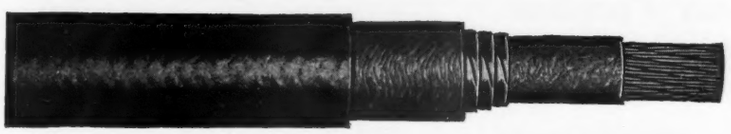

600 VOLT A.V.C. MOTOR LEAD AND APPARATUS CABLE—TABLE L

Sizes No. 18 A.W.G. to 1,000,000 CM insulated with two walls of felted asbestos and a high-dielectric heat-sealed insert, covered with heavy asbestos braid.

Heatproof, fireproof, greaseproof and oilproof, this cable will not dry out and crack, won't burn or carry flame, and will remain permanently flexible. For coil connections, motor and transformer leads where extreme heat and fire hazards are encountered as in steel mills, boiler rooms, etc.

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600 VOLT A.V.C. CONTROL CABLE

In one to 19 conductors. Standard stranding A.W.G. No. 12—19/25 and No. 9—19/22. Other strandings furnished to order.

Designed for use under conditions too severe for control cables with other types of insulation which deteriorate rapidly when exposed to high temperatures. Operates without failure under the attack of heat, oil, grease or corrosive fumes and is suitable for installation either open or in conduit as it has ample moisture resistance.

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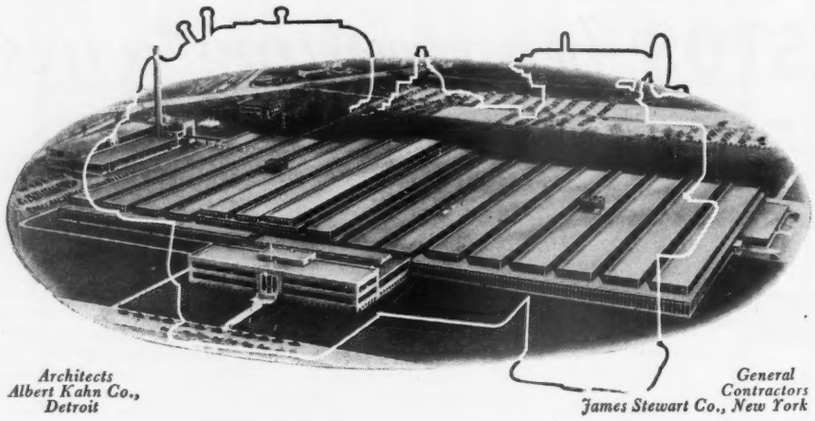
Also refer to Electrical Contracting and Electrical World Buyer's Reference Editions.

ROCKBESTOS—*the wire with permanent insulation*

TO PROTECT ITS NEW $2,000,000 PLANT



Architects Albert Kahn Co., Detroit

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PRATT & WHITNEY SELECTED

Carey 20 YEAR BONDED BUILT-UP ROOF

This Outstanding Job, Covering 671,000 sq. ft., Indicates the Nationwide Confidence of Architects and Industry in Carey's Roofing Experience and Service

THE new plant of the Pratt & Whitney Company, at West Hartford, Connecticut, is probably the most modern and best equipped establishment of its kind in existence.

Every improvement that technical skill could devise, to increase efficiency and reduce overhead, was incorporated. This called for a roof to match other advanced features. Naturally, The Philip Carey Company, with over 50 years of practical roofing experience, was commissioned for this important work.

The roof is a 4-ply Built-Up Roof over cork on a steel deck, bonded for 20 years of trouble-free service. Over 3,100 tons of roofing materials went into the job.

For long life, low upkeep, Built-Up Roofs—large or small—specify CAREY. Write Dept. 31 for "Master Specifications for Built-Up Roofs".

THE PHILIP CAREY COMPANY
LOCKLAND, CINCINNATI, OHIO

are good-will builders that can scarcely be matched.

With industries moving out of congested areas into new sectors flanked by important traffic arteries, there has been a growing consciousness of architectural design, even among the most hardheaded business executives. Today character and distinction can be built into industrial façades with the commonest materials by the use of functional design, so no matter how great the urge to economize might be, it need never be at the expense of good taste.

The plant entrance is the natural point around which to build an impression of the structure as a whole. The smaller the plant, the truer this is. It takes imagination and familiarity with the means of obtaining unusual contours and surface effects to bring striking designs out of the simpler commercial materials, but it can be done. With cast stone nearly as effective as cut stone in applying special features; with the contrasts possible by the use of glass block, structural glass, brick, or stone, in combination; with well-designed canopies and ornamental doors in commercial production—all the materials needed to carry out such ideas are readily available.

Bands of Glass Block

Single-story plants, which are favored for most general manufacturing operations today, have afforded an opportunity for streamlining which has carried over into multi-story plants as well. Nothing has contributed more to this trend than the use of projected steel sash or glass block in continuous bands which emphasize the horizontal lines. Even where the sash is not continuous, the band effect is maintained by special treatment of intermediate brickwork or concrete. These effects are emphasized by carrying the stone required for sills and lintels in one continuous band that frames the horizontal sections. In multi-story reinforced concrete buildings, comparable effects are attained by the bands formed when floor slabs are carried to the outer edge of the building and exterior

In the second oldest school in America

58-year-old Maple Floors

ARE STILL IN DAILY USE!

FOUNDED IN 1638—*Hartford's (Conn.) Public High School is the second oldest organized school in the country. South end of the present structure (above) was built in 1882 (after fire destroyed the previous building)—the north section, in 1897.*

58 YEARS YOUNG!—*In the south section of the Hartford Public High School, all classrooms, corridor, and gymnasium have Hard Maple floors. The floor in this typical classroom is the original Maple, after 58 years of service!*

Hartford *should* know school needs. Its first school was organized just 18 years after the Pilgrims landed. Many present school buildings were built in the 1860's, by then-independent districts, and various types of floors were used. But the standard replacement for years and today, is Hard Maple.

For in Hartford, too, Hard Maple has proved most satisfactory for school floors. Experience, as in the Public High where 58-year floors still serve, has proved Hard Maple's permanence and lasting economy. Tough-fibred, tight-grained Maple does not sliver, splinter, or develop ridges, is lastingly smooth.

And, too, no flooring is more *comfortable*—Hard Maple is warm, dry, resilient, sound-absorbing, bright and cheerful, smoothly sanitary. No flooring is more *practical*—easy to clean, costs less to maintain. It simplifies alterations, and mere refinishing makes it "good as new."

You build for lasting satisfaction when you floor with Hard Maple. By specifying trademarked **MFMA** Maple, (in strips or blocks) you insure all Northern Hard Maple, association-supervised and guaranteed. Ask your architect.

MAPLE FLOORING MANUFACTURERS ASSOCIATION
1787 McCormick Building, Chicago, Illinois

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See our catalog data in Sweet's, Sec. 11/78. Write for photographic folder on Northern Hard Maple and leaflet on heavy-duty finishes for old or new floors.

Floor *with* **MFMA** Maple

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(NORTHERN HARD)

How To Give Your People A Real Break and Get Better Work Done

Install RA-TOX Offset Wood-Fabric Shades! NOTHING, outside of good drinking water, will win the good-will of people in your plant more quickly than this foolproof, easily-installed device. Light without glare! Fresh air without dangerous drafts!

Seven Features of RA-TOX

1. Proved for 20 years.
2. Offset brackets insure perfect ventilation.
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5. Quick, easy operation.
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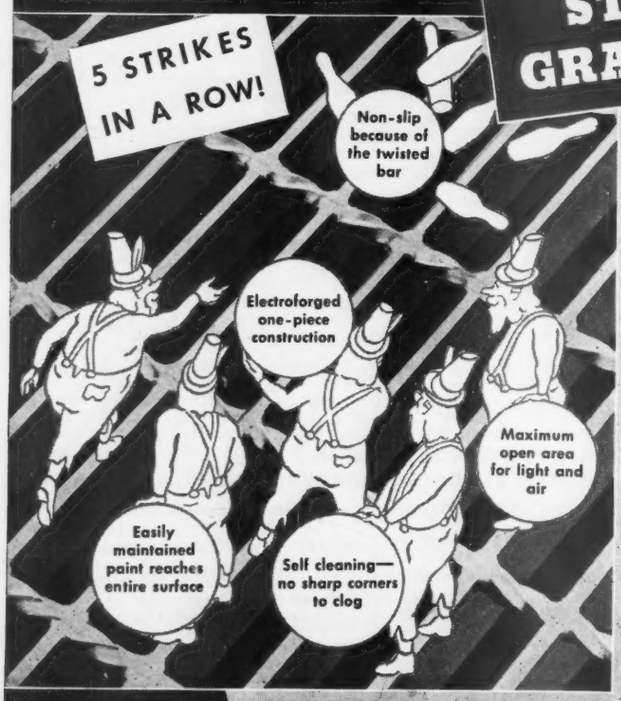
Better working conditions mean more and better work, so write us now for complete story.

RA-TOX
OFFSET WOOD FABRIC SHADES for INDUSTRIAL — SASH —

HOUGH SHADE CORP.
1043 Jackson St. Janesville, Wis.

BLAW-KNOX STEEL GRATING


5 STRIKES IN A ROW!
Non-slip because of the twisted bar
Electroforged one-piece construction
Maximum open area for light and air
Easily maintained paint reaches entire surface
Self cleaning—no sharp corners to clog

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Paper weight size sample . . . Just fill in and mail the coupon.

BLAW-KNOX DIVISION of Blaw-Knox Co.
Farmers Bank Bldg., Pittsburgh, Pa.
SEND GRATING SAMPLE TO.
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columns are set back a little bit.

Where glass block is used instead of window sash, it is generally framed by metal bands of stainless steel or aluminum. Metal strips are also used to highlight the exteriors of structures faced with porcelain enamel instead of conventional building materials.

When you look behind the walls and roofs that reflect these new principles of functional design, the justification for new plants is quickly found in the orderly, economic, and efficient production that results.

Advanced techniques in the construction arts, improved building materials, and equipment specially developed to meet factory needs, are yielding greater utility, permanence, and value in industrial plants. And given delivery of the materials required to erect a plant, builders today can do the work with record speed to meet the most pressing demands.

Pratt & Whitney

(*Continued from page B43*)

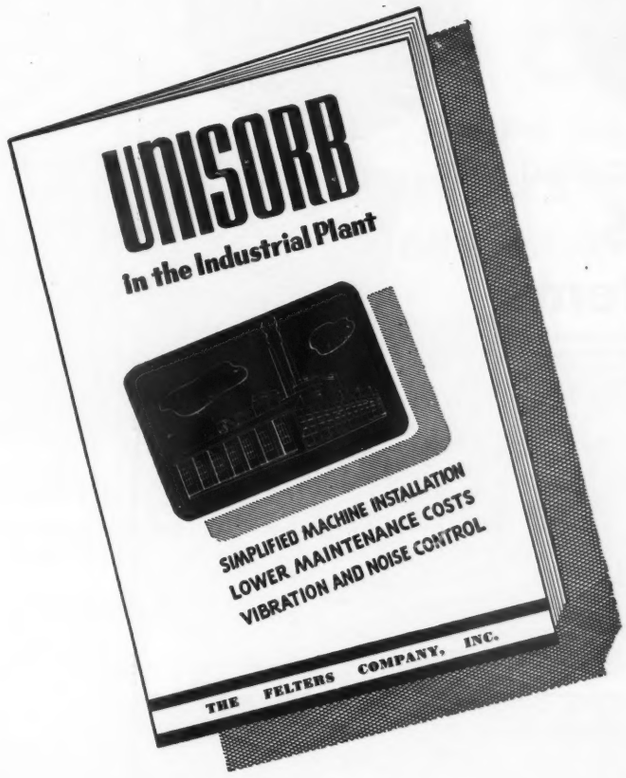
Composite piles for structural steel foundation were used for the entire unit. Cement finished concrete floors are furnished for both sections. Exterior walls consist of low brick curtain walls with continuous, glazed, steel factory-type ventilated sash and copper cornice connected to roof construction. Roofing consists of an insulated metal decking with a tar and gravel waterproof finish.

The pattern shop is separated from the garage by means of a cinder block firewall. The construction of the first floor is similar to the garage, with the exception that steel columns are provided for supporting the second floor construction, which consists of a cement-finished, reinforced-concrete floor slab.

A freight elevator and stairway, centrally located, service the first and second floors of this building. Toilets for the pattern shop are located on the first floor adjoining

For

EXECUTIVES, ENGINEERS



and MAINTENANCE MEN

This booklet, "UNISORB IN THE INDUSTRIAL PLANT" tells concisely where and how the problem of vibration can be alleviated by the most practical yet inexpensive method.

Join the growing list of satisfied customers, who range from users of drop hammers to sewing machines. You have a problem, no doubt, and we can help you. Write us today for your copy, and outline your difficulty.

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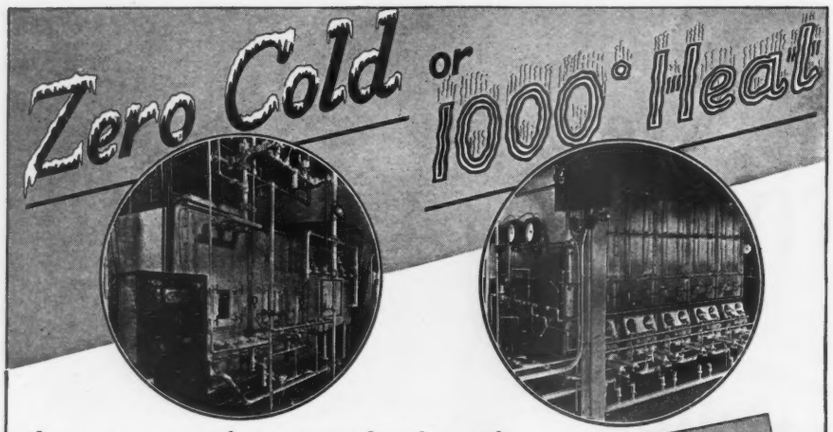

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ROSS Air Systems

Hundreds of exacting processing operations are not only being successfully completed with ROSS pure air systems, —but with far greater uniformity of production. They are designed for maintaining any temperature—from zero to 1000°F. If it's a job for AIR—it's a job for ROSS Air Systems. What's your problem?

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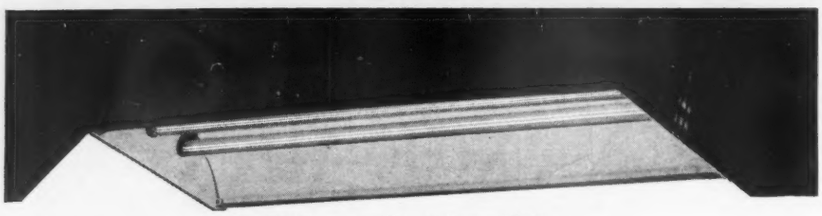

Skyliner • New 2 Lamp Unit

More and Better Light for Less Money And It's Easy to Change Over with these Fluorescent Units

Lumidor units now make possible light levels of unusually fine quality light at lower cost without annoying glare or heat that are correct for general or localized lighting.

SPECIFICATIONS

Sizes: 24" - 36" - 48" x 11¾" wide x 5¾" deep. Finish: Reflector — Luminamel "Hi Bake." Exterior — Platinum grey wrinkle enamel. Ends—Cast aluminum with polished feature strips.

24" No. 826 for two 20 watt lamps $19.50
36" No. 836 for two 30 watt lamps 22.50
48" No. 846 for two 40 watt lamps 24.50

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IMPORTANT FEATURES
Over 75% reflection factor • Over 70 degree cut of angle • Shielded ends • Over 75% high output efficiency • New type 2 lamp auxiliary corrected for power factor and flicker • New type removable starter switch and sockets • Completely wired, ready to hang.

LUMIDOR MANUFACTURING CO.
ALHAMBRA, CALIFORNIA
Manufacturers of a complete line of Fluorescent Desk and Industrial Units

the stairway. Inclosed general office and employment office are in the southwest corner of the building.

Garage and pattern shop sprinkler systems are directly connected to manufacturing building hydrant service.

Straight mazda lighting is used throughout the unit—25-foot-candles being furnished for the pattern shop, and 10 foot-candles for both the garage and pattern storage.

Heat is supplied through unit heaters for garage and pattern storage sections, pipe coils being provided in the pattern shop with individual radiators in the office and employment sections.

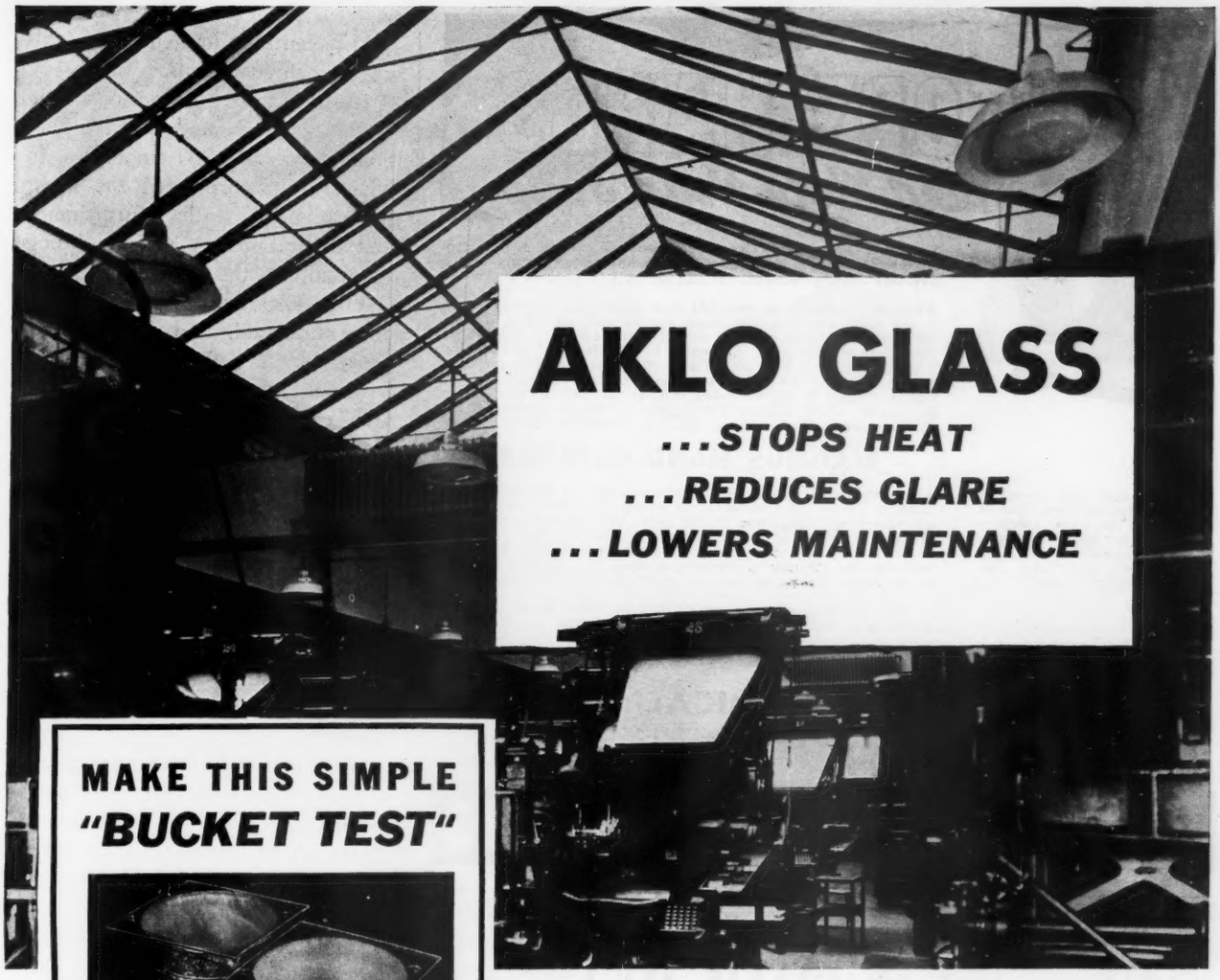
The administration building consists of two sections. The front portion, housing executive and general offices, is of brick and reinforced concrete construction, 245 x 57 feet, two stories and basement. The production and engineering departments are located in the rear portion, which is a brick and structural steel building 245 by 98 feet, one story and basement, connecting the offices with manufacturing building.

Modern Functional Design

The exterior of the building is of modern functional design. All elevations (except that facing the plant) are constructed of buff face brick with wide bands of projected steel windows encircling the building. Stone sills are used beneath windows and projecting lines of brick above. The interior is finished with Flexwood walls, plaster ceiling, and terrazzo floor having light field and black border.

An electric elevator is located in the center of the building, off lobby, which serves all floors. Facing the lobby there is a main stairway leading to the second floor. On both floors, next to the stairway, are the men's toilet room on one side and women's toilet and rest room on the other. Fireproof vaults are located either side of toilet rooms.

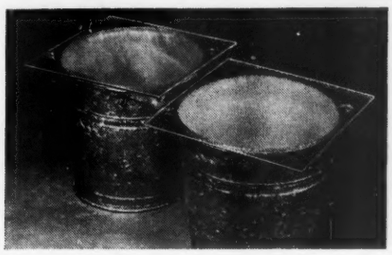
The president's office and directors' room, on the second floor, are separated by a cloakroom and a toilet room. Both offices have walls finished in Flexwood, with acoustic ceilings. A large recessed indirect



AKLO GLASS

...STOPS HEAT
...REDUCES GLARE
...LOWERS MAINTENANCE

MAKE THIS SIMPLE "BUCKET TEST"



Place two buckets filled with water of the same temperature in an exposed sunny spot. Cover one with a sheet of ordinary figured or wire glass, the other with a sheet of AKLO. After several hours, take the temperature of the water in both buckets. The water under the AKLO Glass will be considerably cooler because AKLO keeps out most of the sun's heat. The Glare Test is even simpler. Hold up the two samples of glass used in the bucket test to the sun. Your own eyes will give you the answer in favor of AKLO.

● If there were such a thing as transparent asbestos . . . sun glasses large enough to cover your plant windows and skylights, these two would accomplish expensively what Blue Ridge AKLO Figured and Wire Glass does inexpensively and far more efficiently.

AKLO Glass stops Solar Heat—it absorbs practically all of the infra-red (heat) rays of the sun. Think of this in terms of increased worker efficiency or lower cooling costs.

AKLO Glass reduces Glare. Consider this AKLO feature on a basis of increased production—better hand and eye coordination on the production line.

AKLO Glass lowers Maintenance Costs. No windows or skylights to whitewash or paint—and perhaps you may have overlooked this item of expense.

Get the full story on AKLO. A five minute walk through your plant will bring to light many places where AKLO Glass will pay dividends. Ask your local L·O·F Glass Distributor to give you all the facts or write Blue Ridge Sales Division, Libbey·Owens·Ford Glass Company, Toledo, Ohio.

BLUE RIDGE AKLO GLASS

HEAT-ABSORBING, GLARE-REDUCING, THERMAL SHOCK-RESISTING FIGURED AND WIRE GLASS

Blue Ridge AKLO Glass is a blue-green, low expansion Figured or Wire Glass that absorbs practically all of the infra-red (heat) rays of the sun, substantially reduces glare, and at the same time admits adequate daylight.

FACTORY HANDS
Need More than Soap

The best soap made isn't good enough to do the job of cleaning greasy embedded dirt from the grimy hands of the average factory worker. It can do only a part of the work.

What is needed is a material that penetrates quickly down to the skin, and into the finest cracks and wrinkles, loosening the dirt there, so that it will rinse off with the water. The cleaner must help the water to wet the dirt faster—and if it does this, it will also rinse off quicker and more thoroughly, ending the chapping and irritation caused by unrinsed soap. It should work almost as well in cold as in hot water. And it must not depend on harsh abrasives for its cleaning action. These are the exact specifications for

MAGNUS HAND CLEANER

which has been the preferred hand cleaner in garages, metal working plants and factories of every kind for many years. It's completely harmless to the skin, yet the grimiest hands are quickly cleaned better than any soap can do. It's economical, too, not only because a little goes a long way, but because the Magnus dispenser, modern in principle as well as in looks, measures out the exact amount needed.

Let us send you complete data. Magnus Hand Cleaner is made in three grades—Strong, for extra hard service; Regular, for ordinary conditions, and Mild, for office workers' hands.

It isn't up to your workers to supply their hand cleaning materials. It's as much your responsibility as providing good washrooms and showers. So give them the best there is in hand cleaners to insure safe, effective washing-up.

MAGNUS CHEMICAL COMPANY

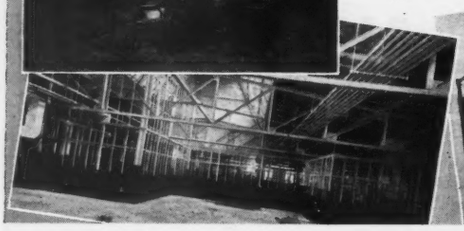
Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants

220 South Avenue **Garwood, N. J.**

MAGNUS CLEANERS

We point with pride to Mills METAL PARTITIONS in INDUSTRIAL BUILDINGS

There is a Mills Metal Partition for every type of Industrial and Commercial Building. Our engineers will gladly submit suggestions. - Ask us!



THE MILLS COMPANY

"A Mills Metal Partition for Every Purpose"

965 WAYSIDE ROAD • CLEVELAND, OHIO

light is centrally located in the ceiling of each room.

In the basement is an acoustically treated cafeteria and kitchen, adequate to serve 2,200 employees, in which are incorporated the latest innovations in seating, furnishings, and decorations. A private dining room adjoins the cafeteria.

The stockroom, locker rooms, office first aid, and photographic department are also located in the basement, together with a large area consisting of a combination women's rest and recreation room, and a general recreation room.

Composition tile floor covering is used in women's rest room, photographic department, and cafeteria, with a cement finish covering the balance of the area. Composition tile flooring is also used for corridors on first and second floors, with linoleum covering for all office floors.

Partitions in basement are generally of cinder concrete, with some hollow tile. On first and second floors all partitions dividing corridors are constructed of plastered 4-in. hollow tile with clear glass in top half. Between executive offices, wood and glass partitions have been used, for general and plant engineering offices metal and glass partitions.

Apart from the acoustically treated ceilings all ceilings are left with the natural concrete finish.

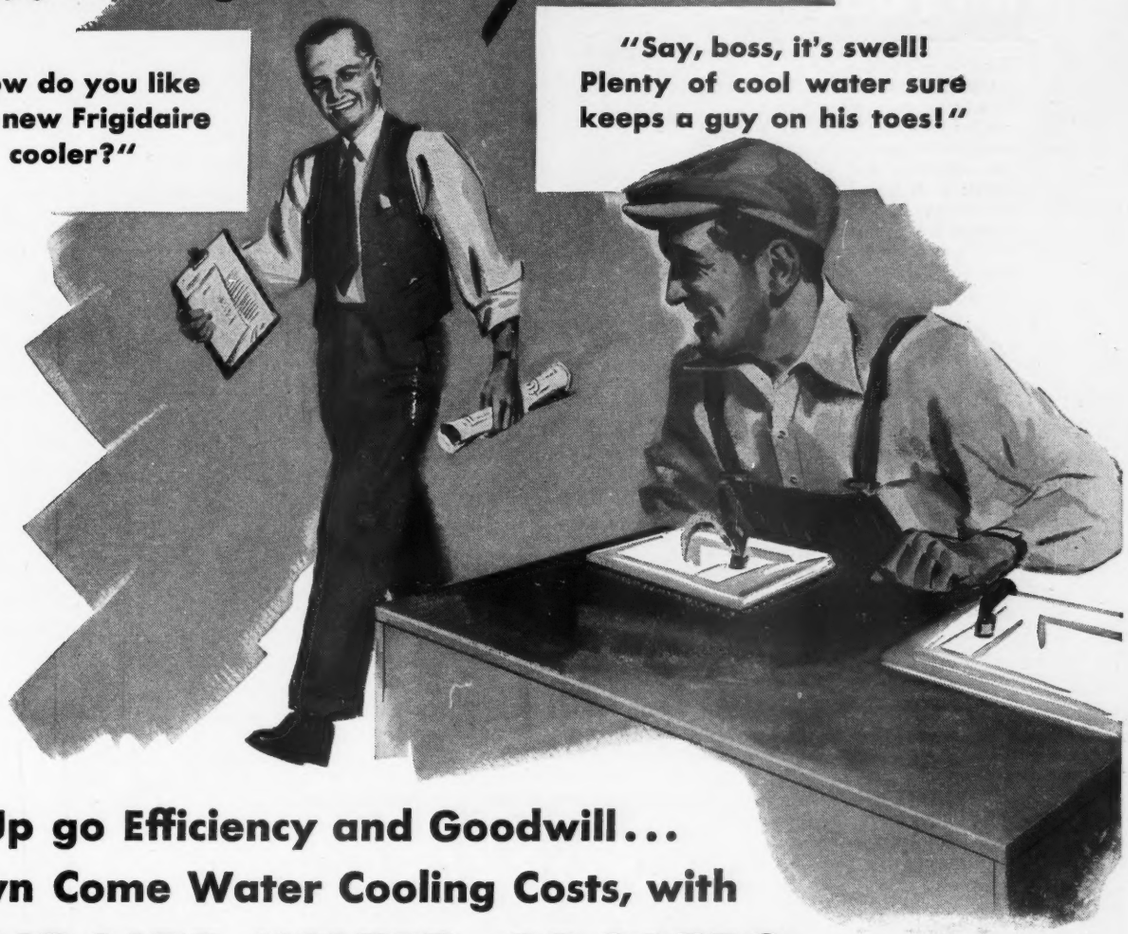
Prepared for the Future

Suspended ceilings have been installed in all corridors to allow for an air conditioning system, if desired later. This system is connected directly to a large fan room located on the roof, which at present takes care of the exhaust system connected with the kitchen, toilet and rest rooms.

Indirect lighting of 25-30 footcandles is installed in all executive and general offices, and in the engineering offices a combination of high intensity and Mazda of 50 footcandles.

The heating system is of the two-pipe, hot water type with copper radiators in all offices. Wall radiators are installed at lower end of

Water Cooling?



Up go Efficiency and Goodwill... Down Come Water Cooling Costs, with

FRIGIDAIRE WATER COOLERS

We don't claim that you'll double your production if you install Frigidaire coolers. But we haven't yet seen a plant in which properly cooled water, in conveniently placed coolers, wouldn't step up efficiency and goodwill more than enough to pay for the installation!

And when you can do this at no extra cost, in fact can save on operating costs over old-style cooling methods, that's mighty good business!

For *proof* that Frigidaire Water Coolers are a first class investment for you, and that in addition they offer superior cooling results at less cost—call in your nearest Frigidaire dealer today. He's listed in the classified telephone book. Or write Frigidaire Commercial and Air Conditioning Division, General Motors Sales Corporation, Dayton, Ohio.

FRIGIDAIRE WATER COOLER—Typical of the complete line of Frigidaire coolers is this industrial model for heavy duty requirements. Cools 35 gallons of water per hour from 80° to 50°, and provides storage for 5 gallons. Extremely economical to operate.

Call in the expert— Call in Frigidaire

CAUTION: If the equipment offered for sale does not bear the "Frigidaire" name, it is *not* a product of Frigidaire Division of General Motors, world-wide leader in mechanical cooling equipment. *Frigidaire Products include*—Water Coolers, Unit and Central System Air Conditioners, Beverage Coolers, Ice Cream Cabinets, Frosted Food Merchandisers, Milk Coolers, Refrigeration Equipment for display cases, walk-in and reach-in coolers.

Loosen HEAT-FAG'S Grip on Your Plant

Provide salt tablets freely to all workers who sweat. Doctors know that salt sweated out by heat and heavy work must be replaced, or workers tire quickly, and are less efficient. Hundreds of great industries have found salt tablets the simple, inexpensive way to replace salt loss and check Heat Fag.

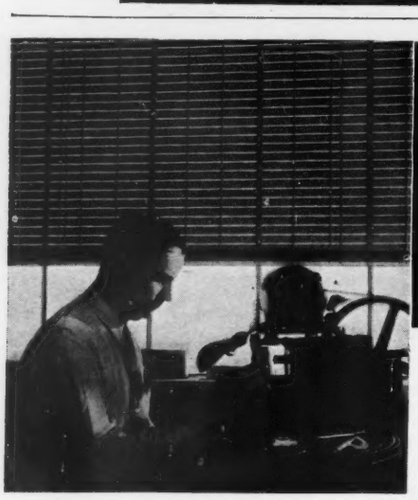
MORTON'S SALT TABLETS

MORTON'S MODERN SANITARY DISPENSER delivers tablets one at a time. Morton's Salt Tablets are made of the most highly refined salt, pressed into convenient tablet form. Easy to take with a drink of water — dissolves in less than 50 seconds after swallowing.

Write for folder: "Heat Fag Among Workers."

ORDER NOW
Dispenser, $4.50
Case of 9000 10-grain salt tablets, $2.60
Shipped Prepaid

MORTON SALT COMPANY
CHICAGO, ILLINOIS



WORKERS NEED THIS PROTECTION!

Too much glare and heat from unshaded windows rob your workers of their efficiency—brings eyestrain, headaches, discomfort to slow up your production. TEMLITE Wood Slat Shades provide improved lighting, shading, ventilation—have proved effective in protecting workers, processes, machines in all branches of industry for 20 years.

FOR ANY SASH • • • ANY WIDTH TO 20 FEET

There's a TEMLITE Shade to give you ECONOMICAL shading—whether you need shades for sidewall, skylight or monitor—factory or office—for any sash—any width to 20 feet. WRITE TODAY—for Circular No. 3800.

THE AEROSHADE CO.
4085 Oakland Ave. Waukesha, Wis.

TEMLITE WINDOW SHADES

bent structural roof trusses which cover the engineering and production departments.

The boiler house, constructed of cinder block, steel sash, and structural steel frame, 37 by 82 feet and 40 feet high, is a part of the building unit containing the pattern and storage building and garage. A brick stack 175 feet high is equidistant from the boilers.

General Foods Corporation

(*Continued from page B47*)

building, but which records on a master annunicator in the boiler house. A city alarm station is located at that point.

Walls of the two steel-frame, truss-roof, mill-type buildings—the pier shed and storage warehouse—are covered with corrugated cement-asbestos sheets, except that in the warehouse brick is used from foundation to window sills and overhead counterbalanced steel doors inclose one side of the pier shed. Corrugated asbestos has also been used on the roof of the storage building, whereas the pier shed has a 2-in. wood roof covered with a slag-surfaced built-up roofing.

Concrete floors in both these buildings have been treated with liquid hardeners. Both buildings are unheated. In both, RLM dome lighting units provide illumination.

Of the remaining steel-frame buildings, the extraction building and the boiler house have special functional frames. The former is 89 x 214 feet, has a monitor roof and four checkered-plate floors at various levels. The boiler house is framed with clear-span trusses.

Both buildings have gypsum plank roofs. Their walls are similar to those brick walls found on processing and can buildings except for 4-in. brick spandrels above extraction building windows. There are some clay tile and steel plate partitions and some tile walls. Unit heaters supply heat, and RLM dome lights, supplemented by some color-

correcting fixtures in the extraction building, light.

Last of the steel-frame buildings is the office and laboratory building, a conventional four-story structure, 70 x 162 feet, with timber floors. Its 2-in. slag-surfaced wood roof is insulated with a layer of cork. Walls and windows are similar to those in the manufacturing buildings.

Besides monolithic concrete floors, asphalt tile and maple have been used. Acoustic ceilings have been installed in part, and heating is by unit heaters and unit radiators, lighting by both indirect and direct lighting fixtures.

Throughout all buildings wall and individual drinking fountains are to be found. Locker rooms are equipped with circular wash-fountains and gabled lockers on which dirt and cast-off clothing cannot accumulate.

On the north side of the processing building are truck loading facilities, with railroad loading on the west between the processing building and the can factory.

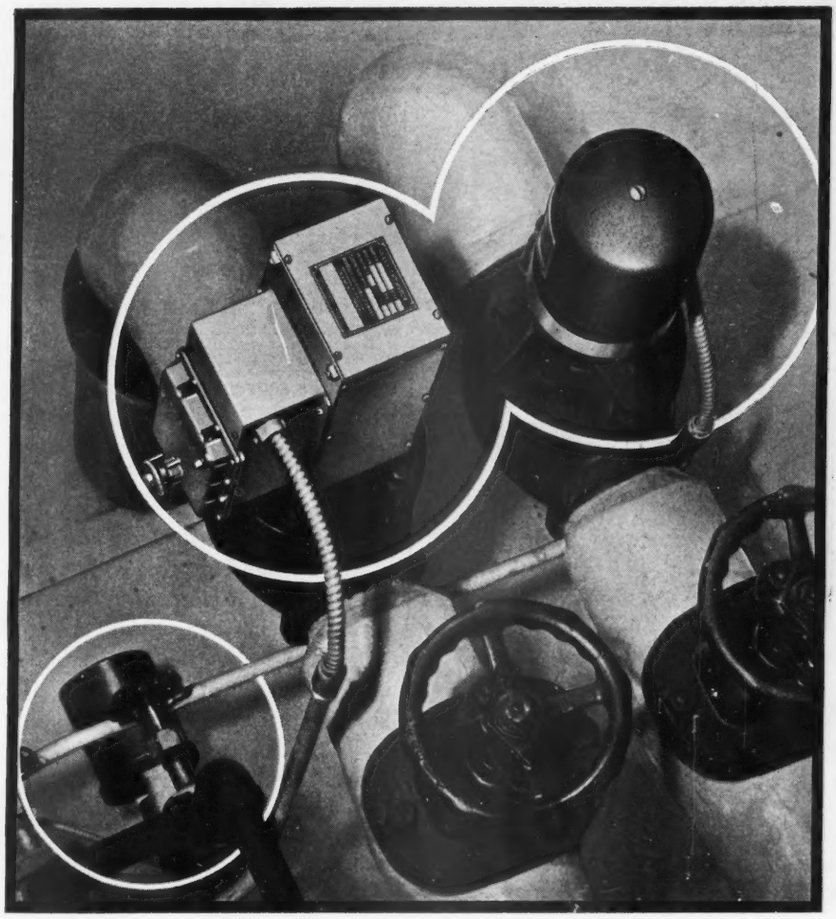
For protection the entire plant is inclosed by a woven wire and iron picket fence.

Landscaping Makes the Building Look Its Best

(*Continued from page B65*)

movement of employees arriving and leaving the factory, reception of raw materials at the logical point of entrance, removal of finished product at the end of the line, location of railroad spurs and siding—all these are important factors that must be studied when considering where buildings will be placed and how the property will be landscaped.

The office building, when there is a group of buildings, usually occupies the most conspicuous place on the factory site, as it is here that the public transacts its business with the company. When all branches of a plant are housed under one roof, the office usually occupies the most easily accessible portion. Normally, that location is in front. Therefore, either the office building



Electric Valves Typical units of the Barber-Colman ELECTRIC System of Temperature Control. Greater accuracy, efficiency, and economy of operation are inherent advantages of all-electric controls. Greater flexibility, adaptability, durability, and simplicity of arrangement are characteristic features of Barber-Colman equipment. For all types of heating, cooling, and air conditioning installations. Please write for further information.

BARBER-COLMAN COMPANY
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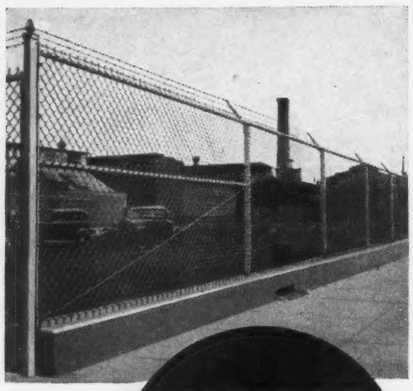
Many advertisers in this issue of FACTORY have not only given you valuable information in their advertisements, but have made it easy for you to get even more detailed data on products and services that can save you money—by inserting coupons in their advertisements requiring only your name and address. Other manufacturers have made valuable catalogs available to you through the Catalog Service Insert found on page B143 of this issue.

Use it. Tap the valuable information thus easily made available to you.

Safe FROM SABOTAGE TRESPASSERS TROUBLE-MAKERS



ANCHOR FENCE

Resists FORCE, ALWAYS STAYS IN LINE, QUICKLY INSTALLED

Wise executives today are profiting from the experience gained during a similar war period 25 years ago, and are protecting their plants against sabotage, trespassers, trouble-makers with rugged, sturdy Anchor Fences.

Anchor Fences protect plants from costly interruptions to production schedules; keep profits from being wiped out. Give your plant adequate protection—by installing Anchor Fence, by adding sections at strategic points or by extending your fencing to protect new additions to your plant. In case of future plant expansion, Anchor Fence can easily be moved to new locations to provide necessary protection there.

Anchor's Nation-Wide Erecting Service is prepared to install your Anchor Fence immediately. Send for the Anchor Fence Engineer today. He will recommend the proper Anchor Fence installation to completely protect your plant, and show you the many Anchor features which give you extra protection and longer life. Or mail the coupon now for free Industrial Fence Catalog.

MAIL COUPON NOW!

Anchor Post Fence Co.
6620 Eastern Ave.,
Baltimore, Md.

☐ Please have Anchor Fence Engineer call.
☐ Send illustrated Industrial Fence Catalog.

Name.....

Firm.....

Address.....

or the front of the plant is the part that should be most attractive. Its setting is the most important.

Location of the building will depend, of course, on its relation to adjacent streets, orientation to light (i.e., drafting rooms to the north), direction of approach of most visitors, first view, and accessibility. To avoid congestion and confusion when there is a separate building housing the offices, the traffic to it should be segregated from the traffic to the plant. A separate approach road with parking facilities is thus suggested, if possible.

With the site selected and orientation of buildings decided, attention must be turned to providing proper drainage and to preparing the top surface for lawns and plants.

It is preferable to keep a building sufficiently high so that the land may be sloped away from it on all sides to carry off surface water, thus avoiding water pockets. If surface drainage cannot be carried directly to the street or drive, it is possible to slope the lawn down to a point lower than the road and back up again to the grade at the road. At the lowest point in this swale a catch basin may be installed to carry the water off in an underground tile system. Such a system of drainage, which in reality is nothing but a broad turf gutter, can have a pleasing appearance if the grade is carefully handled and gradual.

The lawn itself is perhaps one of the most important items in the total appearance of an industrial site. No matter how fine the landscape design may be, if the lawn areas are thin, bare, or weed-infested, the whole scenic value is materially lessened.

Before excavation for the buildings begins, the original topsoil should be stripped away and salvaged, being piled in stock piles until the structure is finished and grading operations start. The sub-grading should be complete before the topsoil is redistributed, as the general texture and consistency of the eight or ten inches directly underneath the topsoil has a substantial effect on the growth of grass. It is

6 REASONS

Why You Should Clean Your Plant with INVINCIBLES

Invincible Vacuum Cleaners *remove* dirt, instead of scattering it around to resettle and damage equipment, machinery and product.

Invincibles remove almost any kind of dirt on all types of floors from rough concrete to highly finished wood.

Invincibles are handy in close, cramped quarters. Indeed, they clean in many places where brooms cannot reach.

Invincibles do a thorough job on overhead pipes, beams, walls, etc., so that these places stay clean much longer.

Invincibles are widely used for cleaning bins, shelving, motors, machinery, boiler tops, work benches, conveyor belts, etc.

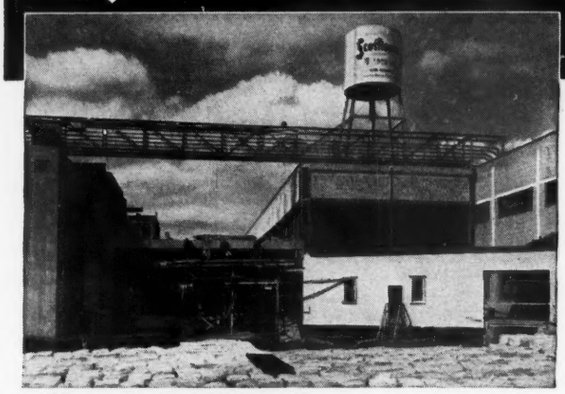
Invincibles cut cleaning costs. Actual case histories show they save an average of $2000 per year in payroll.

Last but not least, Invincibles are built to last. Thousands of them have passed their 20th year of continuous service. Write for a descriptive bulletin and our recommendation.

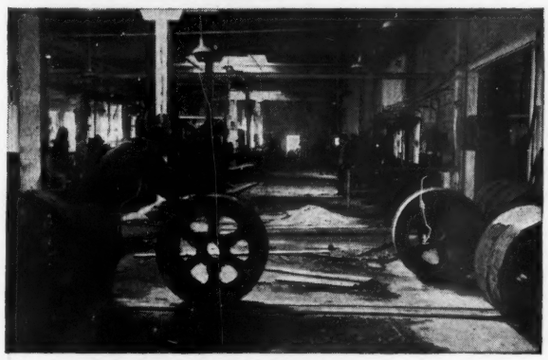
INVINCIBLE
VACUUM CLEANER MFG. CO.
440 DAVIS ST., DOVER, OHIO

Stepping up Production by QUICKER BUILDING *with*

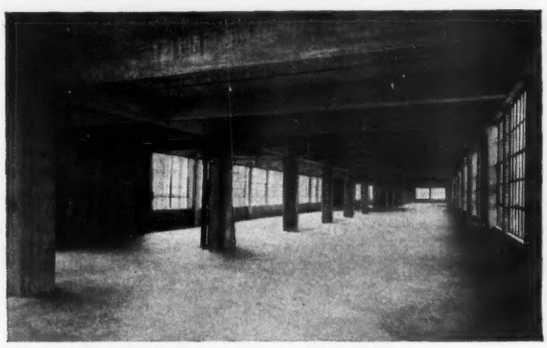
LEHIGH EARLY STRENGTH CEMENT



Addition to the plant of the Scott Paper Company, Chester, Pa.
Engineers: Stone & Webster Eng. Corp.
Contractors: Wark & Company



Iowa Mfg. Company, Cedar Rapids, Iowa
Heavy duty concrete floor



Chicago Flexible Shaft Company, Chicago, Ill.
Arch.: Olsen & Urbain
Gen. Cont.: Campbell-Lowrie-Lautermilch Corp.

The longer building or alterations take—*the higher the cost in delayed return on your investment*

By using quick service concrete, you can save days and weeks—step up production much faster. Lehigh Early Strength Cement makes concrete which can be used in one-third to one-fifth the normal time.

Here are three practical applications of the time and money saving of Lehigh Early Strength Cement:

Scott Paper Company saved 3 weeks on a plant addition because forms were stripped and concrete put to use in 48 hours.

Chicago Flexible Shaft Company met their urgency for a new warehouse by getting concrete of usable strength in 24 hours. Form costs were cut in two.

Iowa Mfg. Company couldn't stop factory operation to wait for new floors. 20 hours after pouring concrete over a week-end, 1,500 lb. iron wheels were rolled over the new floor.

New building construction can be practically continuous because time waiting for concrete to cure is minimum. Quick form removal and immediate re-use reduce form costs. Time saved cuts total job cost, including overhead.

Improvements and repairs often may be made without interrupting business. Concrete for new floors, new ramps, new machine foundations, new loading platforms, new driveways may be placed over night or over the weekend—can often be put into use 24 hours later.

Use Lehigh Early Strength Cement to get quicker return on your building investment. The Lehigh Service Department will gladly answer any questions.

LEHIGH PORTLAND CEMENT COMPANY

ALLENTOWN, PA., CHICAGO, ILL., SPOKANE, WASH.

MONEY SAVING *News* FOR FACTORY MAINTENANCE MEN

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necessary to know whether the subsoil is heavy or sandy, and to select grass seed varieties that will thrive best under prevailing conditions. A point to consider when preparing soil for turf is that a vegetable or flower garden can be tilled and worked each season, but that once soil is prepared for a lawn it must be left untouched for many years.

If the subsoil is not too heavy, drainage is usually taken care of naturally; if it is hard and solid, artificial drainage must be arranged before grading is done. Grass will not grow where water remains for any length of time.

When the subsoil drainage is completed, the black topsoil is respread, preferably four to six inches deep—a depth that will support a good turf. Shrubs and tree sites are, of course, prepared individually, space being dug out for the roots or ball of earth around the roots, and then the excavation filled in with good topsoil.

When the topsoil is in place it should receive an application of commercial fertilizer. All sticks, stones, and foreign matter should be removed and the area rolled with a medium heavy roller, in order to show up soft spots in the grade. These will appear as depressions when rolled, and can easily be graded out with the final raking.

The grass seed itself may then be spread and rolled in. Although lawns may be installed in either spring or fall, best results are usually obtained from fall seeding. Varieties of grass seed that will take hold and grow well in competition with weeds and other materials should be selected. It is a mistake to plant varieties that require upkeep in order to give a good appearance. A lawn need not have expensive maintenance to look well if good seed is selected at the start.

With site, orientation, and grade of building decided, the approach to the factory becomes the third landscaping problem. The approach should be as direct as possible to make the building easily accessible. In neither roads nor walks should the grade be steep. When space does not permit a drive to the en-

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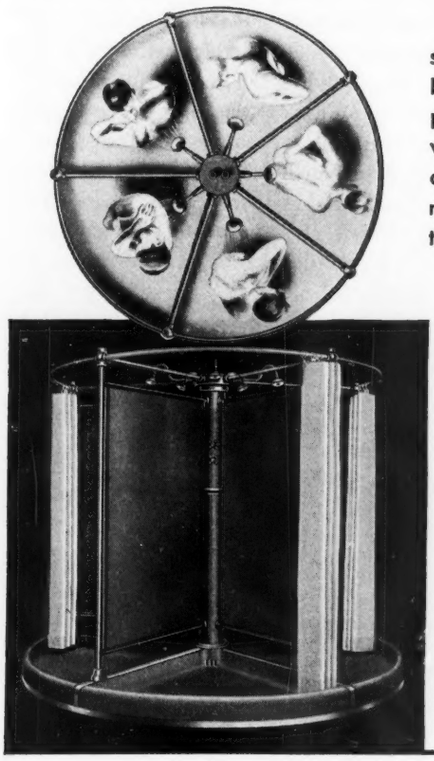

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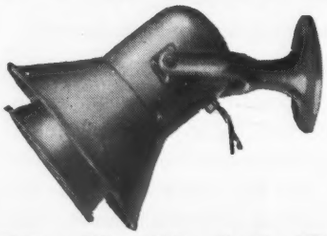

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trance and callers' cars can be parked conveniently on the street, a walk is sufficient. The walk itself is a minor problem. It should be of ample width, not only to be in scale with the building entrance, but also to allow pedestrians to pass easily.

Where there is no drive, it is often advisable to widen the street itself so as to permit parking in front of the factory without impeding street traffic. Diagram 1 shows such a widening.

Parking Areas

Parking areas for factory employees should preferably be placed to the rear or on the side of the building, where they will be reasonably near the employees' entrance. Because parking areas are often unsightly bare patches, the skill of the landscape architect can be brought into play to screen them from the street by means of plant masses. Such a screen also acts as a background for the building.

Planting to Scale

Plant materials chosen for the setting of a factory should be in scale with the building near which they are used. Where a group of low shrubs might form adequate mass effects for a suburban home, in an industrial site the same material would be completely lost beside a large building. The individual units forming a mass planting at a factory are usually of many small trees, any one of which would be too large for residential property. Whatever material is chosen, it must be sizable. A thousand shrubs cannot take the place of one tree where height is important.

With scale in mind, we can turn our attention to planting. As plants are merely to enhance the appearance of the building, they should not in any way compete in interest with it. The landscape architect, in striving to create a setting pleasing to the eye, achieves this by keeping his ground forms and plant masses subservient to the building. Simplicity cannot be too strongly stressed. Overplanting is a fault you will find on many factory sites. A few well-chosen plants will ac-

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complish far more than a motley multitude. A factory setting must look utilitarian, decisive, neat. The setting, to be in keeping, must be completely functional.

The Plant Entrance

Landscaping serves to focus attention on important architectural points. The most important part of a factory building, from an external standpoint, is its entrance. Interest must be spotlighted on that entrance. To make it predominate, the landscape architect uses low, rounded plant forms at the entrance. If such plants are in scale, those that are roughly globe-shaped are most successful. This is true because they will not grow tall in the future and thus serve to defeat the very purpose for which they are planted.

A tall bush or tree at the entrance will tend to distract from the unity of the building as a whole. The planting should not be such that it will break the building into parts. Rather, it should emphasize the entrance as an integral part of the whole building. Diagram 2 shows this. Tall-growing bushes and trees are reserved for the outer sides of the front façade — the building corners.

The plants accentuating the entrance should preferably be evergreen, as they must be effective twelve months a year. The height will depend upon the size of the building and the scale of the entrance, but in general specimens less than 8 feet high, with equal spread, will be adequate. In northern United States this can be accomplished by large specimens of Mugho pine or Japanese yew, the former preferring sun, the latter tolerating shade.

Framing the Picture

Many industrial buildings look best with tall groups of planting at the outside corners of the front. This treatment not only frames the building but also strengthens the unity of an otherwise long, horizontal mass. Furthermore, trees tend to soften the harsh vertical line at the corner and aid in blending the

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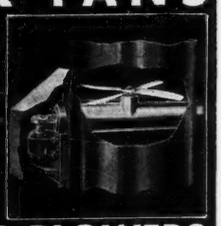

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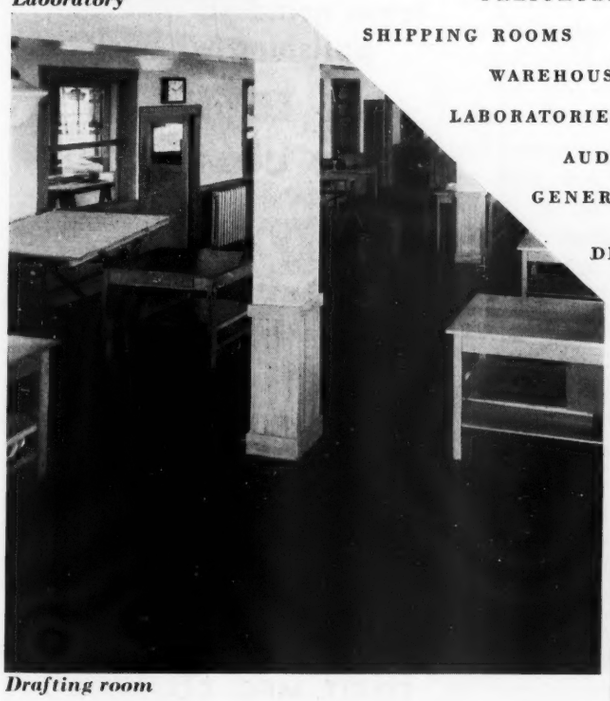

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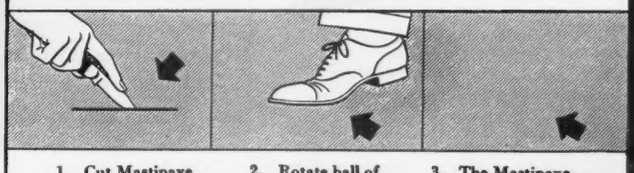

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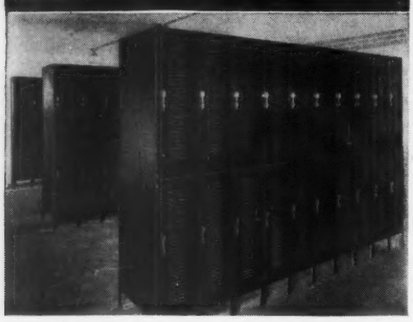

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industrial plant building into the surrounding topography.

Any medium-sized tree that holds its foliage low can be used successfully at the corners. Trees that permit looking under the branches should not be used, but only those that are branched to the ground.

Pine, spruce, fir, and holly are excellent evergreen types for this use if the location is such that smoke and soot are not a hazard. Among deciduous materials, hawthorns are outstanding for this purpose because of their dense growth and their ability to withstand city conditions. The denseness of the twig growth, with great multiplicity of stems in certain varieties, gives a pleasing effect even when the foliage has fallen. The soft gray color of the branches in winter is quite attractive. Any other low-headed trees with this habit of growth could be used, the varieties varying with the locality. Redbud, dogwood, blackhaw, some varieties of the flowering crabapple, Russian olive, and the tree-like forms of viburnums are possibilities over wide areas of this country.

Variation in tree heights is important in any flanking mass of plant materials. Not only does this avoid monotony, but it also enables the landscape architect to model the building height. Gradually blending the tall-headed trees to lower forms, with the tallest masses next to the building, helps to merge the building and the lawn. Tree groups are best bordered by a low type of shrub which will tend to "face down" a planting. Many varieties of sprawling shrubs are excellent for this purpose, such as junipers, cotoneasters, evergreen firethorn, coral berry, and several others.

As the planting must be in sympathy with the architecture to be successful, it must be remembered that generalizations of enframement planting are not applicable to all industrial buildings. One exception that occurs to me is the factory building that is low at the ends of a long façade and steps up to greater heights in the center. Tall plantings at the ends of the building would defeat the purpose. Low-growing materials at the outer cor-

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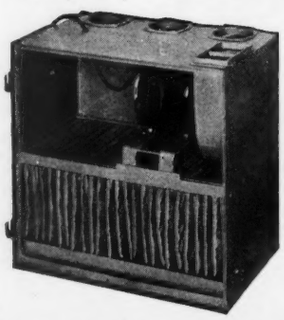

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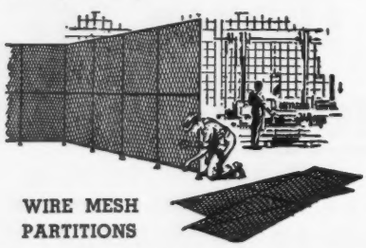

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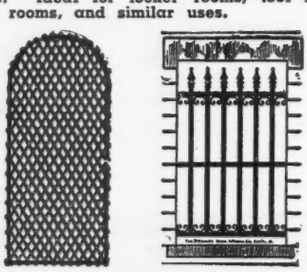

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ners would be far better to strengthen the strong horizontality of the building. See Diagram 3.

High-Headed Trees

The monotony of a long roof line can be broken by the judicious use of tall trees. Their foliage is carried sufficiently high not to obstruct the view of the building or to create a traffic hazard. Where they are planted near enough to the building, they will cast an interesting shadow-pattern on it at certain times of the day. The cooling shade they create will be welcomed by the building occupants.

High-headed trees must be strategically placed to look good from all points of view. As their height will do more than any other factor to "soften" the appearance of a factory building, the primary consideration is their appearance from the street. Tall trees in the foreground, when the building is close to the highway, give a feeling of increased distance and depth to a factory setting. Elms, maples, locusts, the many varieties of oaks, plane trees, lindens, and hackberries are all good trees for the high-headed type.

Screen Planting

To hide unsightly areas, such as parking lots, transformer substations, or storage shacks, the landscape architect employs materials with foliage carried at low levels. Using such plants he can screen objectionable areas from street view. Small trees and shrubs perform this task best. Screen plantings not only serve to hide ugly areas, but help to set off the main factory buildings. To accomplish their purposes, screen plantings do not require deep areas, since much can be done in spaces as narrow as 10 feet, by planning the planting. The choice of materials will include enough evergreens to give some shielding of view in winter.

A band of green planting around a parking lot, or in front of a railroad spur, acts as an effective screen. A raw railroad spur, unprotected by screen planting, can destroy the entire effect of an otherwise good factory setting. If the spur runs on an embankment the problem is more complicated. The landscape architect can either convert the sides of the elevation into a well-trimmed lawn, or he can plant trees and shrubs on the sides of the incline to provide a complete screen. Lawns on sharp hillsides are expensive to maintain, so that well-selected shrubs would be far better for this purpose. Such shrubs would require little care and would be of the sort that would grow to sufficient height to assure the object being screened.

General Considerations

Plant materials selected for groupings on factory sites must be extraordinarily tough. Smoke, gases, and other menaces handicap their selection. Soot from factory chimneys may clog the plants' pores. Such plants as aborvitae and some of the cedars, being especially susceptible to soot, should be avoided.

Any plant material that requires special care means a maintenance problem and should be avoided for factory plantings. If it is necessary to acidify the soil to assure a plant's growth, that particular plant should not be used. All possible maintenance costs should be eliminated.

Factory sites are planted for permanence. A plant that does poorly is worse than no plant at all. Strong plants that have proved they can withstand city conditions and thrive under them are best. Among such plants that can be recommended are members of the *taxus* family (the yews), and such broad-leaved plants as the rhododendrons, azaleas, and mountain laurels. Especially are these latter plants used in the acid soils of the East.

Climate and geography have an important bearing on which plants to select. While most of the industrial areas of the United States are in the northern part, different plant problems present themselves for factories in the South, and those located in Texas and California would have far different plants than those growing in the Great Lakes States.

One axiom can be followed. Use plants indigenous to the area where

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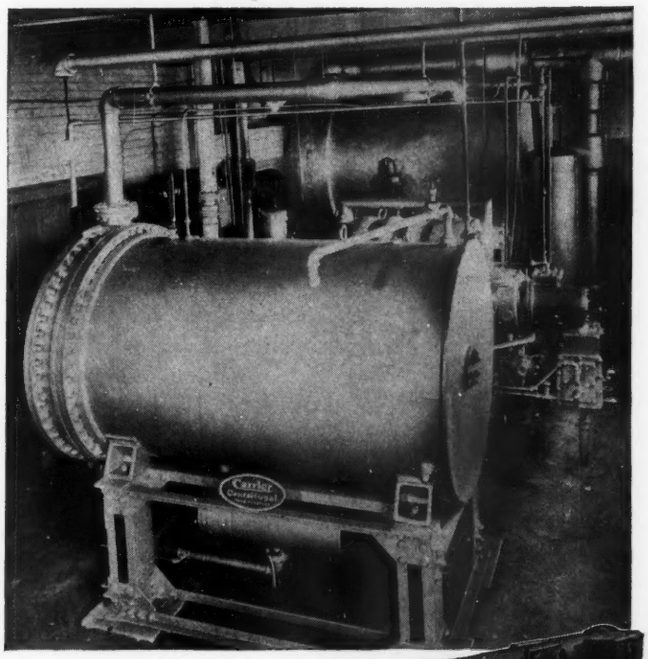

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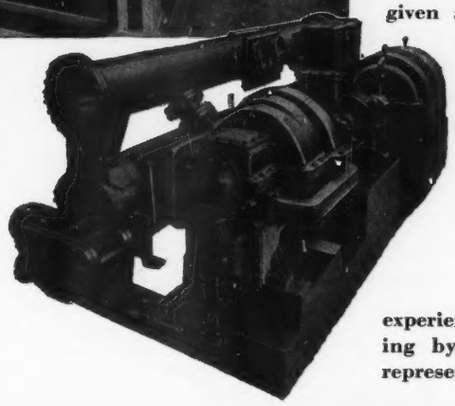

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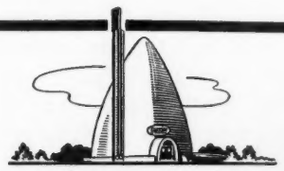

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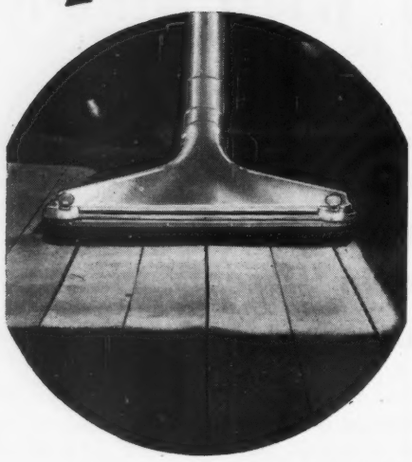

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the factory is located. Use plants that have been proved, never varieties that are at all questionable. It is expensive to experiment, and the results are often unsatisfactory to all concerned.

Color and Height

Plants selected must fit the requirements not only of the climate but also of soil and exposure. A clay soil will require a very different plant than a sandy soil. Some plants will tolerate shade, and others will thrive only in the full sun. The permanent effect toward which the landscape architect directs his efforts depends largely on the wise choice of materials. Much money can be saved by using the right plant in the beginning, eliminating need for future changes as well as maintenance charges.

Color, height, and texture of plantings are important in industrial landscaping. By color I do not mean that of flowers, which I regard as being in poor taste on factory grounds. Color means the variety of greenness—the selection of trees that give a rich autumnal color, the use of materials that will add real beauty and attractiveness to the factory site.

Although evergreens will provide color the year around, they should not be used exclusively. Other types of plantings, selected for their summer foliage, seasonal blossom periods, and autumnal colors, must contrast with the firs and pines.

An occasional clump of Russian olive, with its silver foliage in summer, will do much to enliven a group of evergreens, which might otherwise seem too sombre. High-headed trees such as the elms and oaks, or stubby trees such as flowering crabapple, hawthorn or dogwood, will enhance the lawns.

A knowledge of the growing height of trees is important. The "skyline" of any planting is more interesting if broken or irregular, instead of being a monotonous line. Occasionally this effect may be achieved by placing a tall-growing pine tree in a shrub group.

If the landscape architect works with the building architect, he will undoubtedly try to express in his plans for the factory setting such roads, streets, and paths best suited for all purposes. He will usually offer serious objections to a fence, if it runs in front of the factory, between sidewalk and buildings. Rather than fencing in the area in front of a factory, it would serve the same purpose, and at the same time improve the factory setting, to having the fences eliminated from directly in front of the building. The area between highway and building is to provide a setting for the building. It is not used for any work space, but is solely for the purpose of setting the stage. If their vision is not obstructed by an unsightly fence, passersby may get a better view of the factory. Diagram 4 illustrates proper use of a fence.

To Stop Corner-Cutting

Where there are sidewalks there may be a tendency for those who are supposed to use them to "cut corners." To keep foot traffic on the walks, the walks may be bordered by plantings of tough-growing shrubs such as the junipers, barberries, and cotoneasters. For more formal, decorative effects dwarf Mugho pines and yews are better. Hedges, as a means of controlling foot traffic, should be avoided on factory sites, because hedges require shearing and that adds to maintenance expense. Any plant material that requires pruning and cultivation about the roots should be avoided.

The effect of balanced planting is immediately apparent in the well kept factory site. Symmetry and balance will result from the studied arrangement of the plant materials —the higher masses flanking the corners of the building and lower forms drawing the eye to the entrance. The successful industrial site does not just happen; it is the result of careful study, clear thinking, and exercising restraint against overplanting. Otherwise, it would be a hodgepodge of spottiness. There can be as much balance to a well-planned industrial setting as to a fine drawing or a piece of production machinery.

WHAT'S AHEAD FOR INDUSTRY AS THE WAR AREA WIDENS

Editor's Note: *Recent European war developments warrant a new appraisal of the conflict's effect on American industry.* FACTORY *resumes its "War Communiqués" with this report (as of April 29) compiled in consultation with leading economists, industrialists, and government personnel*

WAR TRADE NOW INFLUENTIAL

Locked in the clinch of economic warfare for eight months, Germany and the Allies have begun to exchange sharp body blows. They may spring apart and start slugging at any moment.

The United States is in no neutral corner. We are definitely holding the towel for the Allies and have a big stake in the outcome. "War business," still largely tentative, still not big (in the 1914-15 sense), has nevertheless taken its hold on our economy. The economists who last fall warned industry — and wisely — to concentrate on the domestic upturn then in the making have been compelled by changing circumstances to admit that war trade has begun to haul us out of what might have been a serious slump.

BUT DON'T LOOK FOR A "BOOM"

The experience factor, however, still checks the danger of an uncontrolled boom. U. S. industry, Allied buyers, and the governments concerned are alike determined to resist the practices that lead to wild bidding and buying, runaway prices, and reckless plant expansion. Even the Scandinavian campaign (which may presage an outbreak in the Balkans or a wide-open war of action on the West Front) has failed to budge the Anglo-French buying mission from its policy of caution. American observers are now convinced that there is in the Allied buying program no single juncture (even the onset of war on the "Lines") at which a vast flood of buying orders would be unleashed here. The Allies have billions to gain from keeping our price structure in line, just as we have billions to lose, ultimately, if it gets out of control. Such are their reserves in munitions (save aircraft), raw materials, and industrial equipment (save machine tools) that the Allies apparently feel that they can afford to move slowly.

The Anglo-French purchasing board has set up a large staff, but most of its work so far appears to be exploratory—always excepting planes and machine tools. Fearful, apparently, that news announcements might disturb prices, the board has been exceedingly close-mouthed.

In raw materials, Allied buying has been dis-

tinctly felt, however. Copper, chemicals, lumber, (including one big order of 100,000,000 feet of Southern pine), and leather (where an exceptionally large purchase is said to be contemplated) have all had a boost from this source.

MUNITIONS ORDERS DELAYED

Munitions orders have been meagre. Present interest appears to center chiefly on explosives and a few semi-commercial items of war equipment such as searchlights. U. S. manufacturers are holding to their policy of refusing to engage in speculative plant expansion without assurance that the cost will be amortized by the buyers or that tax concessions will be granted by our government. Only one major deal, involving, it is said, three complete powder plants to be erected by the Atlas Company, has been worked out. Details have not been announced, but some tax concessions are believed to have been allowed. In general, the Treasury has been vague about its policy on tax liabilities of this character. This is reported to have stalled several similar deals.

Purchases of shells and heavy armament may be in prospect, but there have been few orders. Many U. S. foundries are said to have received inquiries. "British and French reserves must be very great," one Washingtonian observed. "The Allies are surely as well aware as anyone of the terrific time lag, 6 to 24 months, that it takes to get production on these items. They must realize that we have very few firms that know anything about the business at all."

Some of the smaller nations have gotten in with orders—the Netherlands for shell parts, the Finns for small arms. In addition, our own defense requirements are utilizing much of the available capacity. And the War Department's educational orders program, designed to break war-time "bottlenecks," seems about to receive a setback from Congress. The House has transferred to current procurement $14,000,000 of the $16,000,000 originally earmarked for the purpose which will allow for the education of only about 10 plants instead of 116 as originally planned. This might cause a vital delay in wartime. Allied orders to date have touched only a handful of the munitions items we list as "critical."

Here is a clear tip-off. The machine tool industry, which, incidentally, is booked into 1941 despite recent expansions, is getting most of its orders for the types of machine needed in aircraft production, *very few of the kind needed to make shells, bombs, and other ordnance.*

AIRCRAFT EXPANDS 300%

But if the Allies have moved cautiously in other directions, they have acted with astonishing speed in aircraft. A consensus of informed American sources sets the total of Allied commitments for planes close to $700,000,000 including the recently announced $120,000,000 contract for 1,500 newest type Douglas attack bombers and Curtiss pursuit ships. This, the biggest single order on record, is reputedly only the first of a series of similar contracts that will add at least 3,000 more planes to the backlog.

AN UPWARD REVISION

This development forces a write-up of the estimates, best available at the time, of Anglo-French aircraft requirements, as published in FACTORY's "War Communiqué No. 5" (December, 1939). At that time, the Allies were expected to buy no more than 7,800 planes within the year. They have already contracted for at least 4,500. The final extent of their purchases seems to depend only on our own production capacity. As to this, expert estimates vary so greatly that it would be folly to quote a single figure. But it is agreed that our capacity has been expanded nearly 300 per cent, which is borne out by aircraft employment figures now conservatively set at 70,000. Thus the Allies and their buying rivals, the neutrals, have presented us with a booming industry. And save for one engine plant, they have paid for the expansion.

OTHER ESTIMATES REVISED

To arrive at a new computation of total foreign war buying here, it is necessary to add to this greatly swollen volume of airplane orders the probable extent of purchases in other fields. Some upward revision is also needed here. December estimates placed the volume at something less than $500,000,000 for 1940 (barring action on the West Front). But at that time the Danish and Norwegian invasions were remote contingencies and the possibility of an early peace was still a ponderable factor.

The character of Allied needs and the pattern of Allied buying strategy have become a little clearer since then. Conservatively reckoned, the year's purchases of raw materials, finished munitions (other than aircraft) and war supplies of a commercial character will not be less than $1,000,000,000.

Add to this the aircraft orders and you get a

buying impulse of about $2,000,000,000 (double the December estimates) for the first year of the war. That sum was big enough to touch off a frenzied boom in 1914-15. It is still big enough to produce a definite effect on our domestic economy, although no mere $2,000,000,000 can be expected to reemploy our unemployed.

From this $2,000,000,000 must be subtracted substantially more than the $150,000,000 earlier estimated as the loss of normal exports to belligerents. Germany's Scandinavian move has lopped off more than that alone. But we are beginning to perceive—Finland provides an example—that a nation newly included in the war zone shortly blooms as a customer for war goods. Similarly, the loss of our 25-million-plus exports to Denmark may swiftly be balanced by a much greater sale to England of the dairy and meat products for which she formerly depended on the Danes. Such are the unpredictabilities of war.

IRREGULAR "RECOVERY" LAID TO WAR

At any rate, the 2 billions are beginning to tug sharply at the outlines of our peacetime economy, producing a sort of jagged, uncertain recovery. The bearish behavior of the first-quarter indices is now colliding with bullish general forecasts.

The contrast is especially apparent in our export trade. This has soared upward since January 1, ignoring the domestic dip. You will find no agreement, as to the war's effect, between a California fruitgrower, whose export market has shrunk, and an aircraft producer 10 miles away who has been hastily adding to his plant at England's expense. But the cold facts are there in the *total* figures. And our first-quarter exports this year — $1,042,000,000 — are 51 per cent better than the corresponding period of 1939. Our exports to Canada are running 85 per cent ahead of last year, showing increases not only in armaments but in meat, wool, automobiles, and machinery.

Other, if less statistical, evidence of war's effect, may be found in the new clouds of smoke hanging over such cities as Baltimore, where aircraft production is booming, certain steel plants are tooling up for heavy munitions work, and the once somnolent port is alive with traffic (composed in no small part of former American-flag ships now bound for war-zone ports under neutral or belligerent colors.) Or Toledo, an important inland port where a shortage of tankers for the movement of oil to Canada is already reported and Canadian interests are buying American ships, presumably for conversion as oil carriers. This revives memories of World War days when lake craft were cut in half, floated through the St. Lawrence canals, and reconstructed for transatlantic use.

STEEL CONSUMPTION STRONG

Bear in mind that many industries are languishing in the very shadow of war-stimulated lines. It is this irregularity—the abnormal depression in exports of tobacco, grain, fruit, raw cotton, passenger automobiles, and all sorts of consumer goods; the abnormal stimulation of iron and steel products, non-ferrous metals, lubricants, metal working machinery, aircraft, trucks, tractors, and chemicals—that distorts the economy of a nation trading with nations at war. Yet the over-all effect of unbalanced gains in business, if they are big enough, is a more or less general upturn, while they last.

The amount of "war business" itself does not provide an accurate measure of war's effect. Business that is *war-inspired,* or based on expectations of war orders, plays a big part, too. One of the most interesting features of the first-quarter recession has been the strength of steel consumption against the trend. (Bethlehem's first-quarter record is a case in point.) Allowing for continued activity of the automotive industry, this obviously owes much to war factors.

THE BIGGEST NEWS

Not the least of these factors has been our continued heavy exportation of unfinished steel. Railroad replacements have also made a pronounced demand. While denying their inability to cope with boomtime traffic, the carriers have spruced up their rolling stock materially since the war began, although no connection between this trend and the war itself has been acknowledged.

Perhaps the biggest news of all, however, is the fact that *U. S. shipyards are now reliably said to be engaged in the construction of tonnage —naval, merchant marine, and private—fully equal to the peak of World War days.*

Does this mean preparation for a war boom, if not for war itself? Either way, the world demand, spurred by sinkings and increased traffic, is for ships and more ships. World-wide freight rates are soaring higher and higher. Allied buyers have snapped up many of our privately owned vessels. Others have slipped into the service of neutral-flag lines. Few doubt

that the ships now building will find a use if the war continues. And peace, as a topic of speculation, is "out."

ARE WE "IN IT" ALREADY?

This is one of the many ways in which the war sucks us into its vortex whether we will it or not. Many in Washington now say flatly, "We're in it," by which they mean that whether we intervene or not, our fortunes are already tightly tied to those of the Allies.

FACTORY's "War Communiqué No. 2" (September, 1939) pointed out, in comparing current and World War conditions, "Now, as then, everything depends on British mastery of the seas." This mastery remains, and the war etches deeper lines into our economic picture every day. J. H. Carmical, of the New York *Times,* observes that: ". . . instead of the [U. S.] markets being guided by the hard facts of profits and losses of corporations and the statistical position of commodities, it is quite possible that they will be governed by the successes or failures of the Allies at the battlefront."

WHICH SIDE ARE WE HELPING?

The majority of observers feel that our government's policy has been largely to draw our destiny closer to that of the Allies. Repeal of the arms embargo helped only the Allies. The ship transfers helped them. The President's restatement of the Monroe Doctrine helped them. While adding to our defense responsibilities, it relieves Great Britain of the necessity for defending Canada. The anti-Nazi statements of important U. S. officials have helped the Allies by their effect on world opinion. We helped the Allies again by deferring some of our own aircraft purchase program and releasing late-model fighting planes for their use.

The government departments, to whom foreign buyers come for assistance in locating sources of supply, maintain a policy of assisting all comers. Since only the Allies and a few neutrals are in the market, they are the ones who get the help. At the same time, it must be pointed out that this policy has helped to keep the growth of war business orderly, to forfend price rises, to protect our own defense program, to spread orders among all the producers in the field.

Still, it helps the Allies. Practically the only way in which we are not helping the Allies is in the Treasury's recent ruling that the tariff on imported English goods must be computed at the official rate of the British pound (about $4) and not at the value of the "free" pound (about $3.50) which American importers now buy on the private exchanges.

By and large, our government is seen as encouraging the gradual growth of war business which may provide a measure of domestic recovery in an election year. The less-than-estimated appropriations for defense and relief suggest a decided shift in emphasis. Aided by enough war business, the administration seems likely to slip through the year without disturbing the present legal debt limit of $45,000,000,000.

ARE WE PAYING FOR IT?

Already the Allies have had to liquidate some of the reserves, estimated to total about $5,000,000,000, which they hold in U. S. securities. As the tempo of their buying increases, we draw closer to the question of who will pay for further purchases when their reserves run out. The Johnson Act stands in the way of war loans to them. But even the isolationist senators admit privately that the Johnson Act is doomed to repeal at the next session, that it will yield under the pressure of those who say, "Let's help them, if we have to *give* them the money, and see if they can win without the sacrifice of American lives." This is an argument on which some non-interventionists will agree with the interventionists. At any rate, we seemed destined to foot the bill eventually. But listen to this:

"We're paying for it now," says one of New York's foremost economists. "We're accepting the Empire's gold at our rate, $35 an ounce, and the gain they make is just as effective as any loan."

SUMMARY

War business has arrested the recent recession, despite the lack of orders for armaments other than fighting planes. A sustained upturn in buying took hold just as the industrial production index dropped to 103, the low for this year. An appreciable increase in the exports of raw materials, a boom in shipbuilding as well as aircraft and machine tools, and greatly increased orders from Canada, are the war-born factors that will continue the business upturn. Cold analysis indicates that our economic destinies are linked, for the time being, with those of the Allies. Eventually our war business will rise or fall in proportion as we give the Allies the money and credit to sustain their own limited buying power.

INDUSTRY ORGANIZES *For National Defense*

ALERT to what is happening in Europe, the American people are setting out to strengthen their defenses against aggression from any quarter. Already the government has laid down an initial program to that end.

The surest defense against aggression is the ability to resist it. If we are known to be well prepared we may avert attack. If we cannot avert it we shall be armed against it. But preparedness against war means preparedness to wage war.

And modern war is an industry. Like every other industry, it is a matter of men, materials and machines. Fighting men must be skilled workers, trained to use an arsenal of special tools and equipment that are just as diversified and just as essential to success as those of any other industry.

The plant, supplies and personnel of war must rival in efficiency those of any peacetime industry. For the stakes of success or failure in war are not paid in money profits or losses: they are paid in the lives and property of the people, in the security — perhaps the survival — of a nation.

* * *

Sound national defense calls first for a comprehensive program, carefully planned to back up a clear-cut policy as to what we expect to defend. Next comes the appropriation of funds to realize that program. These first steps are vital: they are up to government.

Then program and appropriations must be translated into performance. Native raw materials must be produced, processed and stored. Our meager supplies of strategic materials of foreign origin must be built up until we have accumulated ample stockpiles against the use and wastage of active war. And most urgent, because it is most complicated, raw materials must be manufactured into the innumerable items required to equip the modern army.

We of McGraw-Hill, living with American industry as we do, are keenly aware of the effort that will be required to produce the materials and equipment now needed to modernize our national armament.

Tanks and anti-tank guns, airplanes and anti-aircraft guns, machine guns and automatic rifles, trucks and tractors, destroyers and supply ships — these are but a few items from the endless inventory of military and naval equipment that we must produce by scores, hundreds and thousands, even to arm an Initial Protective Force, behind which we might rally our national resources for decisive effort.

Obviously the army and navy must count on American industry for an ample and continuous supply of this equipment, and industry must organize to produce it in vast quantities. This means the construction and adaptation of manufacturing, transportation and storage facilities, the organization of competent executive and technical staffs, the training of skilled craftsmen in numbers adequate to maintain exacting production schedules. All this, in itself, is an industrial organization problem of the first magnitude, but upon it is imposed still another and vital specification — *sustained speed.*

For time is the all-essential ingredient of modern war. It cannot be bought with any appropriation, however great; once lost, it cannot be recaptured; we must make effective use of it while we still have it. And at this juncture we have none to waste in fumbling, jockeying or experiment.

* * *

Two courses are open to carry out such a program.

1. We might adopt the totalitarian plan of nationalizing industry, conscripting the wealth and labor of all, and suppressing the normal incentives and management of industry in favor of the authority and control of government officials.

2. Or we can stick to the American way of achieving national unity and efficiency by intelligent cooperation between industry, labor and government.

There are those to whom the first will appeal as being the more direct. But I am convinced that most Americans will insist that the job be done in the American way. And in this preference the President, speaking for government, already has indicated his concurrence.

But effective cooperation in so complex and unfamiliar a task demands the utmost of mutual understanding and confidence from all concerned. Confusion of purpose and conflict of opinion are bound to arise — have, indeed, already arisen. Needs and capacities in many fields must be reconciled, relative priorities for various products must be determined, specific parts of the whole program must be allocated, supervised and coordinated with other parts. Government officials, smarting under the whip of urgency, must render quick decisions on highly technical matters, while industrial executives, masters of their own operating technique, must adapt themselves to arbitrary and unfamiliar requirements.

Under such conditions, many problems will arise that must be worked out between the men of industry and those of government. Some of them will be the more acute because of the restrictions under which industry has had to work during recent years—restrictions that have curbed not only the expansion of plant capacity, but also the development of improved processes and the supply of skilled workers. Now, from this sag in our industrial growth, many departments of industry must undertake an overnight expansion of capacity to meet the exacting time schedules of national defense. So industry must look to government for the cooperation that will enable it to expand its facilities promptly and yet write off in reasonable time its heavy emergency investments.

* * *

If we are to deal wisely with these situations, and many more we cannot now foresee, everyone engaged in any part of the defense effort must be willing and able at all times to get a fair understanding of the problems of the others. To help maintain such an understanding McGraw-Hill is peculiarly fitted.

1. By the organized exchange of views and information among our 24 papers, we can help to coordinate the thinking and practice of the 1,000,000 executives, technicians and operating men who are their readers, in matters that have to do with their part in the defense project.

2. Through constant contact with government agencies and the men of industry, our papers can interpret to industry the needs and policies of government and to government the problems and requirements of industry.

3. For the men of industry, each of our papers will expand its regular service as a clearing house of technical and operating data, with special reference to the needs of plants that are producing defense materials and equipment.

To forward these objectives we have set up within our company a National Defense Editorial Board. It is composed of the chief editors of our publications that serve the functions and industries that are of key importance to the defense effort. Made up of men intimately familiar with the personnel and practice of their industries, this board will stimulate and supervise the activities of McGraw-Hill papers insofar as they can contribute to the defense effort. It will outline basic editorial themes, directed to the forwarding of that project, to be adapted by each paper to the special needs of its specific field.

The board will keep close touch with industrial executives and technicians so as to keep abreast of new problems as they arise. It will maintain contact also with government defense agencies and keep our editors posted as to government objectives, plans and problems. Thus it will function as a link between the several governmental defense agencies and the McGraw-Hill editorial organization, and so help each editorial staff to develop a program best suited to the special problems of its industry.

* * *

In thus undertaking our part in an extraordinary industrial effort, we shall not neglect the normal concerns of American industry. So far as may be consistent with the paramount needs of national defense, production and distribution of the goods and services normally consumed by the American people must go on. The effort to mobilize industry for the national defense must be, in large measure, an additional job and an added burden.

That burden is within the capacity of the American people. But it will not be light. And if industry is to carry successfully its heavy share of that burden, it needs the full cooperation of every industrial function.

For more than seventy-five years, through peace and war, McGraw-Hill publications have served to interpret between the various departments of industry and between industry and the American people. Today, as we face these new problems, there is a new and urgent need for interpretation between the industries we serve and the government to which we all bear allegiance. It is fitting that McGraw-Hill should undertake this effort. To it I pledge every resource of our organization.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

CHALLENGE TO INDUSTRY'S PATRIOTISM

Calls for Plain Speaking

IT is a pity that the greatest national defense effort in American history had to be made during a presidential election campaign. For a modern defense effort involves an intensely practical industrial project, while an election campaign involves an intensely emotional political propaganda. And those two don't mix.

That, as I see it, is the chief reason for the welter of claims and denials, charges and counter-charges that have been getting in the way of contracts for planes, tanks, guns and all the rest of the armament for which the American people are so nervously peering down the road.

We are told that the managers of industry, smarting and suspicious under the repeated attacks of government officials for some years back, have been reluctant to assume the abnormal risks of defense contracts without commensurate safeguards, and that the politicians who must authorize those safeguards have been reluctant to do anything that might be construed as letting down the bars for unscrupulous business men to exploit the national emergency. For the one, the business risks of full speed ahead have been too great; for the other, the political risks of full speed ahead have been too great. So we don't go full speed ahead.

This is not written to increase that clamor of recrimination on either side. On the contrary, it is an appeal for some decent and thoughtful consideration on the part of all concerned—consideration for the urgent needs of the nation, for the problems and responsibilities of both the politicians and the industrialists, for the elementary principles of prudent business management, and for the good opinion of the man on the street. He is neither a politician nor an industrial executive. But his hide and his pocketbook are at stake in the national defense program—and he knows it. He has a right to the low-down on what is going on. And if he is left in ignorance or deliberately deceived, for the sake of either political or business whoopee, the payoff will be mighty poisonous political medicine for the politicians and equally poisonous business medicine for the business men who may be responsible.

* * *

The plain stark fact, to be faced squarely by us all, is that the national defense program is an emergency project—a desperately urgent emergency project.

As in every emergency that confronts a democracy, we are harassed by a confusion of counsel. As always, some of the confusion arises from honest but conflicting judgments, some of it from ignorance or muddy thinking. But, unhappily, much of it reflects the deliberate purpose of self-seekers to fish in troubled waters—to capitalize the conjunction of a national emergency and a political campaign to boost their own interests. Already the charge that American business men are unpatriotic and interested only in profit has been put out as a smokescreen to cover up deficiencies for which business men are in no way responsible.

Now the man on the street finds it hard to see through this maze of excited contradiction. Not because he isn't smart—the average American can think straight enough *when he has the facts.* But in this case the facts are obscure and complicated—they have to do with matters that are strange to him. And to make it worse, at the height of his confusion, raucous voices constantly assail his ear with "simple" explanations of it all. But, as so often happens, most of these "simple" explanations make the matter a lot simpler than it really is.

* * *

Consider, for example, the cry that "industry refuses to get busy on national defense until its profits are guaranteed". Very clear and simple, to be sure; but also very false. The charge that American capital is "on strike" in the hour of national need. As silly as it is simple. The assertion that our manufacturers "won't even talk with a government anxious to place orders with them, without large financial concessions", and that "American corporate industry refuses to expand its resources for defense until it receives immunity from proper taxation". The resounding demand that we "conscript wealth as well as men"—whatever that may mean.

Particularly political has been the attack on the aircraft industry. It has been made to appear that aircraft manufacturers were instituting a sit-down strike because, in their greed for profits, they demanded more than 8%. Actually the 8% was not a net profit at all and the only concern of the manufacturers was to fight against incurring losses under the 8% limitation. And army and navy officers have sustained the aircraft manufacturers' viewpoint.

The air is full of explanations which, however simple they may sound, do not explain. And in most cases, I am convinced, the purpose of those who offer them is not to explain but to inflame. Those who try honestly to explain these issues from either side, find it impossible to do the job in such ringing phrases.

As I have said, our country has been caught short. As

a result, there are many reasons for the confusion and controversy. The plain fact is that we can produce our war equipment by only two means: (1) by converting the industries of peace into the industries of war, so far as that is possible; and (2) by building from scratch the new facilities we need to supplement them. In other words, we must create—with desperate haste—a new industry in America—an armament industry.

Right there is the crux of the problem that now confronts the industrialist sincerely trying to equip himself for his part in national defense. For this new armament industry is not the ordinary business risk against which he has learned to weigh the interests of his employees and his stockholders. It does not deal with familiar products and processes. It is not continuous—at least it has not been heretofore in this country—and it may fold up as suddenly as it has opened. It cannot hope to serve thousands of potential customers: it has but one sure customer—the United States Government—and wielding the sovereign power that customer can do just about as it pleases with respect to its needs and demands. Which means that not even this one is a *sure* customer.

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No more unfair or deceptive charge ever has been leveled against American industry and American business men than the accusation of being unwilling to take the normal business risks of the defense program. The risks they are trying to minimize—they cannot possibly avoid them all—are very special and extraordinary risks indeed. So clearly is that true, that I doubt very much whether such questions and charges ever would have risen were it not for the fact we are engaged in a political campaign.

Already some of industry's great units have gone ahead with the building of new facilities, the purchase of special materials, and the actual production of armament in the face of all risks, gambling that their government eventually would work out some reasonable plan to protect them against excessive loss. Others, doubtless will follow suit.

But many other companies, for one reason or another, are not in position to do that. So before they begin to expand their facilities to handle defense contracts, they have asked their *only potential customer for those new facilities* to guarantee them—*not* excessive prices, *not* exorbitant profits, *not* immunity from taxation, as we are being told, but simply against the excessive losses that may result from very extraordinary conditions.

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As this is written, it looks as though the legislation and the rulings necessary to accomplish this purpose soon will be forthcoming. Thoughtful and responsible officials of the government understand the situation and what is needed. But, unfortunately, their understanding and action will not quiet the professional business-baiters. So long as those gentlemen have their own interests to serve, so long as political excitement makes it easy to whip up public demand for a scapegoat to atone for disappointing progress with the defense program—just so long will the business-baiters find a receptive audience for their criticisms.

All of which suggests that business men must carry at this time a double responsibility, in addition to their obvious obligation to do the very best job they know how on their individual parts of the defense program.

The first of these added responsibilities is, of course, to avoid any possible basis for the charge that industry is exploiting the defense program in behalf of excessive profit, unfair treatment of labor or any other unworthy self-interest. The second is to see that the man in the street knows and understands all that I have tried to set down in the foregoing.

For the man in the street is deeply involved in all this. He is "in the street" only to the political orators. To the rest of us, he is the man in the factory, the man on the truck, and the man behind the orders that industry fills. In short, he makes up this living American industry on whom the politician's charges spatter. As an employee he has a stake in the solvency, the security, and the reputation of the very plants at which criticism may be directed. Knowing the facts, he can answer the critics so far as his own plant is concerned and can see how the same kinds of facts apply to all industry. If he is a customer, suffering inconvenience as a result of the plant's service to national defense, a knowledge of the facts behind the plant's problems will help to make him a defender rather than a critic of responsible business management. If he is a neighbor in the community, the facts will equip him to be an interpreter of industry's problems to the people of the home town.

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In this national defense effort, business enters into a new partnership with government, but, more importantly, into a deeper partnership with the American people. It is more than ever essential that it take all of the American people into its confidence, beginning with the people in its plants and going out through the ranks of its customers and its community neighbors to show them that they have a common interest in seeing that the task of national defense is undertaken in the American way.

As we all know, there are in this country some people who would like nothing better than to see American industry fail in this supreme test of service to the nation. They will watch with jealous eyes every move of every company that is engaged on a defense job. They will disparage its achievements, exaggerate its shortcomings, and distort its motives. For they would like to make over American industry to their own pattern, and they'll never have a better chance to get started with it than has been opened up by the national emergency. Or so it looks to them.

So, great as are the business hazards of the defense program for the individual business man, even greater hazards are involved for American industry as a whole. But, knowing the temper of American industrial leadership as I do, I am confident that it will handle its defense assignment with credit to itself and with great advantage to the nation that it serves—whether in war or in peace.

To help in that supreme test is the opportunity and the privilege of the McGraw-Hill organization.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

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